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VOLUME 10, NUMBER 15
AUGUST 1, 1977

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U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESEARCH AND TECHNOLOGY

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 15
AUGUST 1, 1977

W77-07101 -- W77-07600

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

A RECONSIDERATION AND A GENERALIZATION OF LAWRANCE AND FIERING TWO-STATION MODELS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering; and Lisbon Univ. (Portugal). Centre of Urban and Regional Systems.
For primary bibliographic entry see Field 2E.
W77-07157

DESIGN CRITERIA FOR HYDROLOGIC EXTREMES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-07165

THE EFFECT OF SOIL MOISTURE ON CIRCULATION AND RAINFALL IN A TROPICAL MODEL,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W77-07166

HYDROLOGY RESEARCH DIVISION, ANNUAL PROGRESS REPORTS AND SHORT RESEARCH NOTES 1975-76.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 6E.
W77-07336

UTILIZATION OF THE RESULTS FROM REPRESENTATIVE AND EXPERIMENTAL BASINS WITH A VIEW TO THE MANAGEMENT OF WATER RESOURCES,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-07355

REGIONAL STUDY OF THE UPPER BASIN OF THE AAR FROM ITS SOURCES TO BERN: PROFILE OF FLOODS OF A GIVEN RETURN PERIOD AT ANY POINT ON THE RIVER (ETUDE REGIONALE DU BASSIN SUPERIEUR DE L'AAR DE SES SOURCES JUSQU'A BERNE: PROFILE DES CRUES DE PERIODE DONNEE LE LONG DU COURS D'EAU).
Ecole Polytechnique Federale de Lausanne (Switzerland).
For primary bibliographic entry see Field 2E.
W77-07358

HYDROLOGY,
Geological Survey, Reston, Va. Water Resources Div.
L. A. Heindl.
Encyclopedia Britannica Book of the Year, Earth Sciences, (Chicago), p 264-265, 1977.

Descriptors: *Water resources development, *Water supply, *Water pollution control, *United States, Reviews, Remote sensing, Satellites(Artificial), Aerial photography, Waste disposal, Surface waters, Groundwater, Ice, Snow management.

This review of water-resources problems in the United States summarizes the increasing demands for water supplies, hazards of water pollution, and measures being taken to cope with these problems. Withdrawal of groundwater doubled in the U.S. in the past 20 years. By 1976 groundwater provided between one-quarter and one-third of all water used for all purposes, and about half the people in the U.S. depended on it for their domestic supplies. The emphasis of investigations during the year was on the maintenance of groundwater quality. This is particularly a problem where wastes are being injected into the subsurface. Widespread concern for the continuing supply of clean fresh water resurrected interest in the use of mineralized and saline waters for nonpotable domestic, industrial, and agricultural purposes. The use of combinations of data from Landsat 1 and 2 and other satellites demonstrated the practicality of using remote sensing from satellites and high-flying aircraft for preliminary hydrological assessments of the water regimens of large areas. Reports of working groups of the U.S. National Committee for the International Hydrological Decade stressed the need in the United States for better coordination of research in snow-and-ice hydrology, increased application of already proven nuclear techniques in field studies and investigations, more realistically structured programs for drainage-basin research, and additional emphasis on basis hydrology in the university curricula of future water resources experts. (Woodard-USGS)
W77-07494

SYSTEMS APPROACH AND WATERSHED MODELS,
Regional Engineering Coll., Rourkela (India).
G. Krishnaswamy.
Indian Journal of Power and River Valley Development, Vol 24, No 6, p 179-183, June 1974. 4 fig, 7 ref.

Descriptors: *Watersheds(Basins), *Mathematical models, *Hydrology, Parametric hydrology, Stochastic processes, Systems analysis, Simulation analysis, Water resources, Planning.
Identifiers: Component modeling.

Watershed models must be able to forecast floods and the effects of change of land use on various hydrologic phenomena. The types of such models used in hydrology are physical models based on the laws of scaling, analogue models based on the mathematical identity of the governing equations of physically different systems, and mathematical or conceptual models for describing mathematically the response of catchment to the processes of precipitation and evaporation. Considered is the development of the mathematical models for watershed analysis, with particular emphasis on the systems approach. The ideal model would specify completely the properties of and processes occurring in all the relevant components of the watershed. Thus, the hydrologic effects of a rainfall event over a watershed could be determined objectively through modeling. The solution of such problems may involve statistical analysis of samples of observed data or may deal with the interrelationships among individual hydrologic parameters or groups of parameters. The former method of approach can be classified under stochastic hydrology, the latter under parametric hydrology. The systems approach is one method of tackling such problems. The overall operation of the hydrologic system is examined, the complex physical laws of the internal system components not being considered. The process of development of the mathematical watershed model is described, the various available models are indicated, and the enormous possibility of further research work in this new field is hinted. (Bell-Cornell)
W77-07556

2B. Precipitation

THE EFFECT OF SOIL MOISTURE ON CIRCULATION AND RAINFALL IN A TROPICAL MODEL,
British Meteorological Office, Bracknell (England).
J. Walker, and P. R. Rowntree.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 435, p 29-46, January 1977. 13 fig, 5 tab, 32 ref.

Descriptors: *Model studies, *Rainfall, *Tropical regions, *Africa, Mathematical models, *Soil moisture, Arid lands, Deserts, Circulation, Evaporation, Albedo, Energy budget, Heat balance, Persistence, Foreign countries, Foreign research.
Identifiers: *Sahel(Africa), *Sahara.

The sensitivity of a tropical model to soil moisture content was investigated, using a simplified version of the UK Meteorological Office 11-layer model. The model area represented a zonally symmetric version of West Africa. The results of one experiment (D) with a desert in the same latitudes as the Sahara were compared with those of another experiment (W) in which the desert was replaced by moist land. The initial fields contained an idealized easterly wave which developed during the experiments to form depressions whose movement, structure, and associated rainfall were strongly influenced by the dryness of the underlying surface. The energetics of these disturbances were analyzed, and two distinct mechanisms for maintaining their eddy kinetic energy were proposed, depending on the soil moisture. Results from W suggest that once the land was moist it maintained itself in this state for at least several weeks. In D, however, the initial aridity north of 14 deg N was sustained, suggesting that ground dryness alone can cause deserts to persist. An analysis of observed rainfall data for the northern Sahel provided much stronger evidence for the persistence of rainfall anomalies from year to year than did similar analyses for the southern Sahel. The possibility that soil moisture anomalies could contribute to this persistence was briefly discussed. (Humphrey-ISWS)
W77-07166

DYNAMICS OF CLIMATIC HAZARDS IN NORTHEAST BRAZIL,
Wisconsin Univ., Madison. Dept. of Meteorology.
S. Hastenrath, and L. Heller.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 435, p 77-92, January 1977. 8 fig, 3 tab, 31 ref.

Descriptors: *Climatology, *South America, *Rainfall, *Droughts, Forecasting, Floods, Seasonal, Climatic data, Circulation, Air circulation, Analysis, Foreign countries, Meteorology.
Identifiers: *Brazil(Northeast region).

Departure characteristics of the large-scale circulation were studied in relation to extreme drought and flood years in northeastern Brazil. Ship observations during 1911-72, compiled with a one degree square resolution and extending between 30 deg N and 30 deg S from the African coast to the eastern Pacific, form a major observational basis. The rainy season of northeastern Brazil is narrowly centered around March/April and is related to the southernmost seasonal migration of a lower-tropospheric confluence axis over the adjacent eastern tropical Atlantic. The 'Secas' of Ceara province are characterized by an equatorward expansion of the South Atlantic, and a poleward retraction of the North Atlantic high--associated with a northward displacement of the enclosed near-equatorial trough of low pressure. Concurrently, the zonally oriented bands of maximum cloudiness and precipitation frequency stay farther north, the North Atlantic trades weaken, and the South Atlantic trades become stronger than in the long-term mean. The sea surface temperature pattern during a deficient rainy season in northeast Brazil is characterized by positive departures in a broad band across the North Atlantic and in the eastern Pacific, and anomalously cold waters in most of the South and equatorial Atlantic. During abundant rainy seasons in northeast Brazil, departure patterns are approximately in-

verse to those patterns typical of drought years. A strong negative linkage exists between northeast Brazil rainfall and sea surface temperature along the Ecuador/Peru coast. This seems to be caused by inverse long-term pressure variations over the eastern South Pacific and South Atlantic oceans, which in turn may be part of large-scale mass adjustments of the Southern Oscillation type. Development of the equatorward expansions of the North and South Atlantic highs, preseason precipitation in northeast Brazil and the Guayanas, and location of the cloudiness and precipitation belts over the adjacent western tropical Atlantic are among the more promising predictors for seasonal foreshadowing of extreme rainy season behavior in northeast Brazil. (Humphreys-ISWS)
W77-07167

ESTIMATING ABOVE AND BELOW NORMAL RAINFALL PERIODS OVER SOUTH AFRICA, 1972-2000,
University of the Witwatersrand, Johannesburg (South Africa).
T. G. J. Dyer, and P. D. Tyson.
Journal of Applied Meteorology, Vol. 16, No. 2, p 145-147, February 1977. 1 fig, 12 ref.

Descriptors: *Rainfall, *Estimating, *Climatology, *Africa, Precipitation(Atmospheric), Forecasting, Mathematical model, Time series analysis, Droughts, Wet seasons, Meteorology.
Identifiers: *South Africa, Rainfall predictions.

By fitting a trigonometrical regression model to a regionally averaged time series for the period 1910-72 and by extrapolation to the year 2000, an estimate of future extended wet and dry spells was made for the summer rainfall region of South Africa. It was suggested that the periods 1972-81 and 1991-2000 will experience above normal rainfall and that the period 1981-90 will be drier than normal. Results to date show that mean regional rainfall for the hydrological years 1972-73 to 1975-76 has conformed to the suggested pattern. (Sims-ISWS)
W77-07170

PARAMETERIZATION OF DEPOSITIONAL ICE GROWTH,
Utah Water Research Lab., Logan.
K. G. Hubbard.
Journal of Applied Meteorology, Vol. 16, No. 2, p 177-182, February 1977. 4 fig, 2 tab, 12 ref, 2 append. NSF GA-43181.

Descriptors: *Ice, *Crystal growth, *Model studies, *Mathematical models, Crystals, Cloud physics, Precipitation(Atmospheric), Particle size, Meteorology.
Identifiers: Parameterization.

The physics of ice nucleation as a temperature-dependent process was incorporated into a parameterized equation which simulates the depositional growth of ice at the expense of liquid and vapor phases. The depositional parameterization was examined in the framework of a parcel model, and the results were compared to a more detailed ice model containing 20 mass categories of ice crystals. Comparisons showed that the parametric and detailed models yield nearly identical results. A computational advantage is present with the parameterization because the necessary size distribution information is greatly reduced and the time step is much larger. (Sims-ISWS)
W77-07171

DIGITAL RAINGAGE RECORDER,
Siena Coll., Loudonville, N.Y. Dept. of Physics.
D. P. Donnelly.
Journal of Applied Meteorology, Vol. 16, No. 2, p 205-207, February 1977. 4 fig, 5 ref.

Descriptors: *Rain gages, *Instrumentation, *Rainfall, Equipment, Precipitation(Atmospheric), Time, Timing, Rates, Meteorology.
Identifiers: *Recorders, Recording systems, Digital recorders.

A digital raingage recording system was described. The apparatus includes a tipping bucket raingage and an electronic system which prints out the time of day each time the bucket tips. The electronic system operates on direct current and is capable of printing 3 lines per second. With a bucket mechanism designed to trip on 0.254 mm of rain, a rainfall rate of 1000 mm/h would require 1.1 lines per second. (Sims-ISWS)
W77-07172

AN OXYGEN-ISOTOPE CLIMATIC RECORD FROM THE DEVON ISLAND ICE CAP, ARCTIC CANADA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
For primary bibliographic entry see Field 2C.
W77-07175

SIMULATION OF A SERIES OF DAILY AREAL MEAN RAINFALLS FOR A BASIN USING RAINFALL OBSERVATIONS AT A REFERENCE STATION LOCATED OUTSIDE THE BASIN,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
F. Bultot, and G. L. Dupriez.
Hydrological Sciences Bulletin, Vol 21, No 4, p 569-585, December 1976. 7 fig, 7 tab, 3 ref.

Descriptors: *Rainfall, *Watershed(Basins), *Model studies, *Mathematical models, Correlation analysis, Time series analysis, Estimating, Estimating equations, Probability, Foreign countries, Distribution patterns, Foreign research, Weather patterns, Precipitation(Atmospheric), Meteorology.
Identifiers: *Belgium.

A mathematical model was built which enables daily estimates to be made of the areal mean rainfalls for a basin using rainfall observations at a reference station of the same climature, but which may be situated at some distance from the basin. The method consistes of: (1) determining the probabilities of the characteristic types of association between areal mean rainfalls of varying magnitude at the basin and rainfall events of various types at the reference station, (2) establishing the conditional distributions of areal mean rainfalls at the basin, and (3) estimating the areal mean rainfalls at the basin by the Monte Carlo method and by accepting that the mean basin rainfalls and the reference station rainfall are, in their respective statistical distributions, fractiles of the same order. The validity of the simulated series was checked by means of various tests. (Sims-ISWS)
W77-07356

PHYSICAL PROBLEMS OF WEATHER MODIFICATION,
Warsaw Univ. (Poland). Faculty of Geophysics.
For primary bibliographic entry see Field 3B.
W77-07357

PREDICTABILITY OF EFFECTS OF A SEVERE LOCAL STORM IN PENNSYLVANIA,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
W. J. Gburek, R. L. Hendrick, A. S. Rogowski, and M. L. Paul.
Journal of Applied Meteorology, Vol 16, No 2, p 136-144, February 1977. 9 fig, 3 tab, 13 ref.

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Excessive precipitation, *Pennsylvania, Storms, Thunderstorms, Hurricanes, Erosion, Sheet erosion, Rill erosion, Soil erosion, Runoff, Watersheds(Basins), Rain gages, Stream gages, Rainfall disposition, Precipitation intensity, Precipitation excess, Soil water movement, Surface runoff, Subsurface runoff, Meteorology.
Identifiers: *Hurricane Agnes.

On 24 May 1975, an isolated thunderstorm in east-central Pennsylvania produced more than 4 inches of rain in 2 h over an Agricultural Research Service instrumented area. The return period for that storm appears to exceed 650 years. Simulation of the precipitation excess from all soils within the storm area, using a modification of the Mein and Larson infiltration equation, indicated surface runoff from a limited number of soil types--the same soils which exhibited severe erosion plus the alluvial soils of the stream channels. About 17% of the area affected by the storm accounted for nearly all of the measured surface runoff. Post-storm field investigation showed that the principal damage by erosion was restricted to corn fields on two soil groups, both silty clay loams over a fragipan. Soil losses due to sheet and rill erosion were estimated in the field as ranging from 15 to 110 tons/acre. Soil losses resulting from gully erosion could have been as high as 300 tons/acre in some areas. Simulation of the event by using modification of the universal soil loss equation showed that the location and amount of damage could have been predicted. Analysis of the impact of the storm illustrated that: (1) the lack of a general wind field which would give the storm horizontal motion accounted for the extreme 2 h rainfall, (2) presently available techniques for the simulation of runoff and erosion can be successful under these most extreme conditions, and (3) the source-area concept of runoff and sediment production must be considered in modeling such events. (Sims-ISWS)
W77-07369

MAXIMUM 5-MINUTE AND HOURLY RAINFALLS ON METROMEX NETWORK, 1971-1975,
Illinois State Water Survey, Urbana.
F. A. Huff, and J. L. Vogel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 714, Price codes: A05 in paper copy, A01 in microfiche. Circular 126, 1977. 81 p, 1 fig, 2 ref, 1 append. NSF ENV 73-07796.

Descriptors: *Rainfall, *Data collections, *Illinois, *Missouri, Networks, Measurement, Hydrology, Hydrologic data, Urban hydrology, Cities, Rainfall intensity, Basic data collections, On-site data collections.
Identifiers: *METROMEX.

During the summers (June-August) of 1971-1975, a network of 223 recording raingages was operated in circular area of 2000 sq mi centered on the St. Louis Gateway Arch. This network was operated in conjunction with Metromex (Metropolitan Meteorological Experiment) which involved comprehensive research concerning urban effects upon precipitation (inadvertent weather modification). The weighing bucket raingages were spaced approximately 3 mi apart, with the recording charts rotating once every 24 hours, which permitted reading of rainfall amounts for any period of 5 minutes or longer. Heavy rainfall data from this network were tabulated. The first set of data lists gage, data, and amount for each occurrence of point rainfall that equalled or exceeded 0.45 inch in 5 minutes. This corresponds to the 5-minutre rainfall having an average recurrence interval of 2 years at any given point in the Metromex network. The second set of data provides similar information for hourly rainfall amounts that equal or exceed the average 2-year recurrence value of 1.50 inches. Raingage amounts were listed for every storm during the summers of 1971-1975 in which one or more gages recorded an hourly amount of 1.50 inches or more. Hourly amounts were listed for each gage for each hour during each storm. The date of the storm, its time

of occurrence, and the synoptic storm type associated with the rainfall were shown. Legal descriptions of the raingage locations were included as an appendix to this report for the convenience of the user. (See also W76-03353, W76-06680 and W76-09734) (Humphreys-ISWS)
W77-07374

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 1, TEXT OF REPORT,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W77-07566

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 2, APPENDICES,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W77-07567

DEPOSITION OF MINERAL NITROGEN BY RAIN IN THE LAMTO SAVANNA, (IN FRENCH),
Ecole Normale Superieure, Paris (France). Laboratoire de Zoologie.
For primary bibliographic entry see Field 5B.
W77-07574

2C. Snow, Ice, and Frost

PARAMETERIZATION OF DEPOSITIONAL ICE GROWTH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2B.
W77-07171

AN OXYGEN-ISOTOPE CLIMATIC RECORD FROM THE DEVON ISLAND ICE CAP, ARCTIC CANADA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
W. S. B. Paterson, R. M. Koerner, D. Fisher, S. J. Johnsen, and H. B. Clausen.
Nature, Vol. 266, No. 5602, p 508-511, April 7, 1977. 6 fig, 23 ref.

Descriptors: Isotope studies, *Oxygen, Ice, , *Glaciers, *Canada, Climates, *Climatic data, Climatology, Dating, Radioactive dating, Cores, Core logging, Temperature, Laboratory tests, Data processing, Glaciology.
Identifiers: *Devon Island(Canada), *Ice caps, *Greenland.

Isotope measurements on two adjacent cores through the Devon Island ice cap provide a well-dated climatic record for the past 5000 yr. Fluctuations in annual values include much 'noise', and ice flow over a rough bed produces distortions in the lowest 5% of core which covers roughly 120,000 yr. Comparison with the Camp Century, Greenland, record helped to separate climatic changes from changes in ice thickness or flow pattern. (Sims-ISWS)
W77-07175

FRAZIL--THE INVISIBLE STRANGLER,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate.
D. M. Foulds, and T. E. Wigle.
American Water Works Association Journal, Vol. 69, No. 4, p 196-199, April 1977. 10 fig, 3 ref.

Descriptors: *Frazil ice, *Intake structures, *Great Lakes, Lakes, Rivers, Ice, Crystals, Cooling, Radiation, Temperature, Water temperature, Winds, Mixing, Freezing, On-site investigations, Ice loads.

Frazil is an ice phenomenon that usually occurs between midnight and dawn and only when the water has become supercooled. Frazil can choke intakes and open channels through its 'stickiness,' blocking the water flow to facilities. The development of frazil was traced, and suggestions to alleviate the problems it causes were made. (Sims-ISWS)
W77-07177

RECTILINEAR LEADS AND INTERNAL MOTIONS IN THE ICE PACK OF THE WESTERN ARCTIC OCEAN,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
J. R. Marko, and R. E. Thomson.
Journal of Geophysical Research, Vol 82, No 6, p 979-987, February 20, 1977. 9 fig, 1 tab, 14 ref.

Descriptors: *Sea ice, *Arctic Ocean, *Ice cover, *Remote sensing, Satellites(Artificial), Rock mechanics, Movement, Winds, Water circulation, Currents(Water), Stress, Shear stress, Cold regions, Arctic.
Identifiers: *Ice leads, Faults(Ice), Fractures(Ice), Rectilinear leads, Brittle fracture, LANDSAT, *Ice packs.

Large-scale (100 km) rectilinear lead patterns are a common feature of the Arctic Ocean ice cover. It was shown that many of the characteristics of these patterns can be explained by analogy with rock mechanics. In particular, the existence of two intersecting lead sets, the typical intersection angles of 28 deg, and the observed relative shearing motions are consistent with faulting associated with semibrittle failure. Further support for this explanation has been obtained by using NOAA and Landsat satellite imagery over an approximately 100-km-square area of the Beaufort Sea. These data provided coverage of 2 days of ice deformation prior to the formation of a lead at 14 deg to the axis of compression. Strains of 4% over the 2-day period were within the range attributed to rock distortion preceding semibrittle failure. It was suggested that the range from brittle to plastic type behavior is feasible within the Arctic Ocean sea ice, depending upon the applied rate of strain and/or the ambient confining pressures. (Sims-ISWS)
W77-07373

THE RELATIONSHIPS OF MARINE MAMMAL DISTRIBUTIONS, DENSITIES AND ACTIVITIES TO SEA ICE CONDITIONS,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-07409

SNOW AND ICE HYDROLOGY IN THE UNITED STATES--CURRENT STATUS AND FUTURE DIRECTIONS,
National Committee for the International Hydrological Decade, Washington, D.C.
Work Groups on Snow and Ice Hydrology, Final Report 1976. 73 p, 86 ref, 2 append.

Descriptors: *International hydrologic decade, *United States, *Snow, *Ice, *Hydrology, Glaciers, *Research priorities, Reviews, Documentation, Research and development, Planning, Instrumentation, Remote sensing, Surveys, *Bibliographies.
Identifiers: *Research needs.

The Work Group on Snow and Ice Hydrology was organized to coordinate U.S. efforts in this field and to promote the development of knowledge in the area. The Work Group identified four major areas in which it could make significant contributions: (1) Identification of research needs and accomplishments; (2) Improvement of the fragmented communications in the U.S. within the field of snow and ice studies; (3) Elimination, wherever possible, of the duplication of effort; and (4) Translation of research results into applications and management techniques. The primary function of this report was to discharge the responsibilities under the first objective. This was done through a critical review of the field of snow and ice hydrology, which resulted in identification of major problems as well as research needs. On the basis of this review, several recommendations were made, which if implemented, will help to satisfy the last three objectives. (Humphreys-ISWS)
W77-07565

2D. Evaporation and Transpiration

HORIZON HYDRAULIC CONDUCTIVITIES DETERMINED IN SITU FOR THE WILDERNESS, MEXICO AND MENFRO SOILS AND USED TO PREDICT SOIL WATER CONTENT,
Missouri Univ.-Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-07103

EVAPORATION OF WASTEWATER FROM MOUNTAIN CABINS,
Colorado State Univ., Fort Collins, Solar Energy Applications Lab.
For primary bibliographic entry see Field 5E.
W77-07284

2E. Streamflow and Runoff

MISSOURI RIVER POWER CURVE REGRESSION EQUATIONS,
Missouri Univ., St. Louis. Dept. of Geology.
L. J. Lee.
Journal of Hydrology, Vol. 33, No. 1/2, p 123-132, March 1977. 2 tab, 19 ref.

Descriptors: *Missouri River, *Regression analysis, *Statistical methods, Discharge(Water), Width, Depth, Slopes, Meanders, Flow, Streamflow, Hydrologic properties, Equations, Correlation analysis, Analytical techniques, Data processing, Hydrology, Rivers, *Computer programs.
Identifiers: Power curve equations.

By the use of a statistical computer program power curve regression, equations and correlation coefficients were developed for as many river parameters as could be accurately quantified for the Missouri River. This was done with the expectation that these equations would be useful in (1) sorting from the many river parameters those variables that are strongly relted, and (2) aid in predicting changes the river might undergo as a result of the manipulative behavior of man. Results indicated that the equations developed may be useful for both purposes. (Sims-ISWS)
W77-07152

A RECONSIDERATION AND A GENERALIZATION OF LAWRANCE AND FIERING TWO-STATION MODELS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering; and Lisbon Univ. (Portugal). Centre of Urban and Regional Systems.
L. Valadares Tavares.
Journal of Hydrology, Vol. 33, No. 1/2, p 185-190, March 1977. 6 ref.

Descriptors: *Streamflow, *Model studies, *Mathematical models, Flow, Equations, Formulas, Analytical techniques, Time series analysis, Synthetic hydrology, Simulation analysis, Statistical methods, Hydrologic aspects, Hydrology, Rivers, Streams, River systems.

Lawrance and Fiering two-station models were reconsidered; and a more general model for the generation of flow sequences at satellite stations,

assuming that flows at master stations are known, was obtained and presented. There are no restrictions about the number of parameters of the time-series models which were adopted to describe the studied flow sequences. (Sims-ISWS)
W77-07157

STOCHASTIC PROPERTIES OF DAILY TEMPERATURE IN RIVERS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5B.
W77-07159

DESIGN CRITERIA FOR HYDROLOGIC EXTREMES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-07165

REGIONAL STUDY OF THE UPPER BASIN OF THE AAR FROM ITS SOURCES TO BERN: PROFILE OF FLOODS OF A GIVEN RETURN PERIOD AT ANY POINT ON THE RIVER (ETUDE REGIONALE DU BASSIN SUPERIEUR DE L'AAR DE SES SOURCES JUSQU'A BERNE: PROFILE DES CRUES DE PERIODE DONNEE LE LONG DU COURS D'EAU).
Ecole Polytechnique Federale de Lausanne (Switzerland).
J. M. Giovannoni, and J. R. Schneider.
Hydrological Science Bulletin, Vol 21, No 4, p 603-616, December 1976. 6 fig, 4 tab, 3 ref, append.

Descriptors: *Watersheds(Basins), *Runoff, *Foreign countries, *Flood discharge, Europe, Hydrology, Surface waters, Rives, Statistical methods, Correlation analysis, Regression analysis, Frequency, Flood recurrence interval, Flood flow.
Identifiers: *Switzerland, *Aar River(Switzerland).

The peak discharge Q sub T of a flood (annual series) with a recurrence interval T was ascertained using equation Q sub t = (A sub T) (S to the a power) for the upper reaches of the River Aar above the city of Bern, Switzerland. In the equation, S = basin area, and a and A sub T are basin parameters. The discharge Q sub T was calculated from direct measurements at hydrological stations on the river after extrapolation of short series and correction of possible erros. A sub T and a were calculated by linear regression, and their values were established between the logarithms of Q sub T and S. (Humphreys-ISWS)
W77-07358

MANNING N AND THE OVERLAND FLOW EQUATION,
Agricultural Research Service, Stillwater, Okla.
W. O. Ree, F. L. Wimberly, and F. R. Crow.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 1, p 89-95, January-February 1977. 7 fig, 5 tab, 9 ref.

Descriptors: *Mannings equation, *Watersheds(Basins), *Overland flow, *Model studies, Laboratory tests, Small watersheds, Hydrograph analysis, Grassed waterways, Range grasses, Flow, Runoff, Vegetation, Channel flow, Hydraulics, Hydrology.

Manning n values for the overland flow surfaces of a grassed watershed were derived by hydrograph analysis and by using average watershed slope and overland flow length values determined by geomorphic methods. These values were compared with Manning n values from laboratory tests on channels having similar grass covers. Close agreement was found for poor grass, but not for fair and good grass. The methods can be used to estimate the overland flow equation for an ungaged watershed if a Manning n value for the overland flow surface can be estimated. (Sims-ISWS)
W77-07371

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 2, REGRESSION OF MEAN ANNUAL FLOWS ON PHYSIOGRAPHIC PARAMETERS,
Department of the Environment, Vancouver (British Columbia). Inland Water Directorate (Pacific Region); and Department of the Environment, Vancouver (British Columbia). Water Resource Branch.
R. M. Leith.
Report Series No. 46, 1976, Ottawa, Canada, 21 p., 4 fig., 3 tab, 5 ref, 4 append.

Descriptors: *Streamflow, *Average flow, Regions, Regression analysis, Parametric hydrology, Drainage, Drainage area, Ponding, Sampling, River basins, Mathematical models, *Canada.
Identifiers: *British Columbia, *Annual flows.

Mean annual flows have been regressed on physiographic parameters for 62 hydrometric stations in British Columbia. The equation for unit mean annual flow, UMAF, UMAF = 10.4 + 0.0319 NPOSI - 0.172 x 1/100 ELEV - 0.131 x 1/100 DSNW - RAFOR + 0.909 RASWP + 0.758 x 1/10,000 SEW explained 61% of the total variation and had a standard error of estimate of 1.71 cfs/sq.mi. This equation was developed by backward elimination of variables and was tested by examination of residuals, by geographic plot, by runs test and by tests of normalcy. In the process of building the equation, subsamples of the 62 stations were taken and regression equations developed. This allowed the identification of important parameters, other than those which appear in the above equation. For example, Barrier Height to North, BHN, appeared in five of the seven intermediate equations. (See also W76-04180) (WATDOC)
W77-07434

EFFECTS OF THE CATASTROPHIC FLOOD OF DECEMBER 1966, NORTH RIM AREA, EASTERN GRAND CANYON, ARIZONA,
Geological Survey, Cheyenne, Wyo. Water Resources Div.; Geological Survey, Tucson, Ariz.; and Prescott Coll., Ariz.
M. E. Cooley, B. N. Aldridge, and R. C. Euler.
Available from Supt. of Documents, GPO Washington, DC 20402, price $2.70. Professional Paper 980, 1977. 43 p, 41 fig, 1 plate, 3 tab, 18 ref.

Descriptors: *Floods, *Flood damage, *Mudflows, *Maximum probable flood, *Arizona, Flood data, Channel erosion.
Identifiers: *Grand Canyon(Ariz), North rim.

Precipitation from the unusual storm of December 1966 was concentrated on highlands in northern Arizona, southwestern Utah, southern Nevada, and south-central California and caused widely scattered major floods in the four States. In Arizona the largest amount of precipitation was in the north rim area of eastern Grand Canyon, where about 14 inches was measured. The largest flows occurred along Bright Angel Creek and the MilK Creek-Dragon Creek part of the Crystal Creek drainage basin. The maximum effects of the flood were along Milk Creek-Dragon Creek, where a mudflow caused extensive channel modification. Floods that occurred in the Bright Angel and Crystal Creek basins have a recurrence interval of only once in several centuries. The streamflow that resulted from the storm on the Kaibab Plateau caused considerable local scouring and deepening of channels, including some renewed arroyo cutting. The most catastrophic effects of the 1966 floods were caused by two mudflows that extended from the edge of the Kaibab Plateau along Dragon Creek in the Crystal Creek basin and Lava Creek in the Chuar Creek basin to the Colorado River. More than 10 other large mudflows occurred in Nankoweap, Kwagunt, Crystal, and Shinumo Creek basins. About 80 large debris slides left conspicuous scars in the amphitheaters at the heads of the side gorges, and at least 10 small slides occurred on the Kaibab Plateau. (Woodard-USGS)
W77-07480

APPARENT REGIONAL SKEW,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.; and Geological Survey, Reston, Va. Water Resources Div.
J. R. Wallis, N. C. Matalas, and J. R. Slack.
Water Resources Research, Vol 13, No 1, p 159-182, February 1977. 16 fig, 15 tab, 4 ref.

Descriptors: *Historic floods, *Regional analysis, *Correlation analysis, Methodology, Spatial distribution, Temporal distribution, Flood frequency, Estimating, Equations.
Identifiers: *Skew estimates.

Differences in the relationships between the mean and standard deviation of regional estimates of skewness for historical flood sequences and the relations derived from several well-known distribution functions may be explained in terms of spatial or temporal distribution of values of skewness. Unless skewness is large, variations in estimates of skewness for different time periods are unlikely to be ascribable to chance. (Woodard-USGS)
W77-07484

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70--PART 15. ALASKA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07493

TECHNIQUES FOR ESTIMATING FLOW CHARACTERISTICS OF WYOMING STREAMS,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-07495

2F. Groundwater

NON-EQUILIBRIUM THERMODYNAMICS OF GROUNDWATER FLOW SYSTEMS: SYMMETRY PROPERTIES OF PHENOMENOLOGICAL COEFFICIENTS AND CONSIDERATIONS OF HYDRODYNAMIC DISPERSION,
Nevada Univ., Reno. Desert Research Inst.
C. L. Carnahan.
Journal of Hydrology, Vol. 31, No. 1/2, p 125-150, September 1976. 2 tab, 50 ref. OWRT B-067-NEV(2).

Descriptors: *Groundwater, *Groundwater movement, *Thermodynamics, Dispersion, Porous media, Hydrology, Base flow, Hydrodynamics, Mathematical studies.
Identifiers: *Hydrodynamic dispersion, Transport process, Phenomenological coefficients, Anisotropic media, Groundwater hydrology, Dissipation function, Transformed coefficients.

The theory of non-equilibrium thermodynamics was applied to transport processes in groundwater flow systems. The theory was postulated to be applicable to a continuum model of porous medium in which fluxes and forces at points in the fluid phase are averaged over a representative elementary volume. Group-theoretic principles were applied to the phenomenological coefficients, and it was shown that these considerations can simplify the phenomenological equations both by removing unallowed coupled effects and by reducing the ap-

parent number of independent, numerical components contained in a given phenomenological coefficient. It was found, for example, that in porous media having certain symmetry properties, chemical reaction rates cannot be coupled to vector flows of heat and matter. Examination of the current theory of hydrodynamic dispersion in the light of non-equilibrium thermodynamics led to a proposed modification of the former. It was proposed that phenomenological coefficients for coupled and direct dispersive processes be formed of the product of a fourth-rank tensor, dispersivity of the medium, with the dyadic product of solute velocities, rather than with fluid flow velocities. Group theory was applied to the resulting coefficients, and new results were obtained for the forms assumed by the coefficients in certain anisotropic media. (Lee-ISWS)
W77-07143

TYPE CURVES FOR ANALYSIS OF PUMP TESTS IN LEAKY STRIP AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vandenberg.
Journal of Hydrology, Vol. 33, No. 1/2, p 15-26, March 1977. 5 fig, 1 tab, 5 ref.

Descriptors: *Curves, *Pumping, *Aquifer testing, *Mathematical models, *Observation wells, Graphical methods, Test wells, Aquifers, Leakage, Analytical techniques, Boundaries(Surfaces), Drawdown, Theis equation, Transmissivity, Storage coefficient.
Identifiers: *Type curves, *Strip aquifers, *Leaky aquifers, Time-drawdown curves, Matching procedure, Image wells.

The analysis of pump test data for strip aquifers, for example, buried bedrock channels, can be carried out by fitting the early part of the time-drawdown curve with the Theis non-equilibrium curve or with one of Hantush's curves for leaky aquifers. The width of the strip can then be deduced from the behavior of the later part of the time-drawdown curve. However, if the width of the strip is of the same, or less, magnitude as the distance between pumped well and observation well, the method can no longer be applied since the boundaries cause a strong deviation from the type curves even at early times. Also, analysis of the data by the Theis method leads to a severe underestimation of the transmissivity. The boundary value problem for linear horizontal groundwater flow in a leaky aquifer towrds a face of constant discharge was formulated and then solved, leading to an expression from which transmissivity can be determined by a type-curve matching procedure similar to the Hantush and theis methods for radial flow. (Visocky-ISWS)
W77-07145

WATER FLUX IN SOIL AND SUBSOIL ON A STEEP FORESTED SLOPE,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W77-07147

FINITE-ELEMENT ANALYSIS OF GROUNDWATER FLOW IN MULTIAQUIFER SYSTEMS, I. THE BEHAVIOR OF HYDROLOGICAL PROPERTIES IN AN AQUITARD WHILE BEING PUMPED,
Kyoto Univ. (Japan). Dept. of Agricultural Engineering.
K. Fujinawa.
Journal of Hydrology, Vol. 33, No. 1/2, p 59-72, March 1977. 6 fig, 11 ref.

Descriptors: *Groundwater movement, *Aquitards, *Model studies, Mathematical models, Groundwater, Aquifers, Pumping, *Finite element analysis, Analytical techniques, Flow, Movement, Hydrologic properties, Hydrology.
Identifiers: *Multiaquifer systems.

In multiaquifer systems, aquifers are separated by aquitards through which water flows from one aquifer to another. The asumption of vertical flow in aquitards and horizontal flow in aquifers has been found reasonble in many field situations and has been utilized in the design of quasi three-dimensional flow models. It has also been revealed by earlier workers that the vertical leakage is affected by the storage in the aquitard as well as by its permeability and the properties of the adjacent aquifers. In this paper, one-dimensional, finite-element analysis was used to determine the effect of storage in an aquitard separating two confined aquifers on the distribution of hydraulic head in the aquitard and on the flux from or into the adjacent aquifer. This paper also considered how many nodes are required to solve the problem numerically with adequate accuracy. The results of this study should be helpful in the design of numerical schemes for analyzing multiaquifer systems. (Sims-ISWS)
W77-07148

INTERCONNECTION OF SURFACE AND UNDERGROUND WATER RESOURCES IN SOUTHEAST DURHAM,
Teesside Polytechnic, Middlesborough (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 4B.
W77-07149

ANALYSIS OF FLOW AGAINST DISPERSION IN POROUS MEDIA,
Birmingham Univ. (England), Dept. of Civil Engineering.
A. N. S. Al-Niami, and K. R. Rushton.
Journal of Hydrology, Vol. 33, No. 1/2, p 87-97, March 1977. 3 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Dispersion, *Porous media, *Model studies, Mathematical models, Soil water movement, Groundwater movement, Aquifers, Groundwater, Flow, Aqueous solutions, Water quality, Pollutants, *Path of pollutants, Water pollution, Hydrology.

Analytical solutions were presented for dispersion in a finite porous media which is controlled by the flow of a low concentration fluid towards a region of higher concentration. The flow was assumed to be one-dimensional in a horizontal direction. A step function concentration was enforced at the source of the dispersion, while zero concentration, or a condition in which the change in concentration is proportional to the flow, was applied at the other boundary. Different forms for the solutions were given to facilitate the computation of particular values. Special attention was paid to the situation when the flow balances the effect of the dispersion. (Sims-ISWS)
W77-07150

SPECIFIC YIELD DETERMINATIONS FROM A CONSOLIDATED SANDSTONE AQUIFER,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
M. Price.
Journal of Hydrology, Vol. 33, No. 1/2, p 147-156, March 1977. 4 fig, 23 ref.

Descriptors: *Specific yield, *Aquifers, *Sandstones, *Laboratory tests, Centrifugation, Groundwater, Groundwater movement, Groundwater resources, Pores, Porosity, Pore water, Hydrologic properties, Specific retention, Water storage, Hydrology, Foreign research, Foreign countries.

The centrifuge method of measuring specific yield was described briefly. Measurements of samples of Penrith Sandstone from a site in Cumbria indicate a much higher value than that derived from a pumping test by curve fitting. A previous explanation for the discrepancy, based on a capillarity mechanism, is only partly borne out by further work, but the mechanism could be significant at other sites in other aquifers. Further research is needed to define standard conditions for measuring specific yield by the centrifuge method. (Sims-ISWS)
W77-07153

CALCULATION OF THE LEAKY AQUIFER FUNCTION,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
B. Hunt.
Journal of Hydrology, Vol. 33, No. 1/2, p 179-183, March 1977. 6 ref.

Descriptors: *Aquifers, *Model studies, *Mathematical models, Equations, Formulas, Analytical techniques, Mathematics, Wells, Water wells, Pumping, Transmissivity, Hydrology.
Identifiers: *Leaky aquifer function, Infinite series functions.

Two infinite series representations were obtained for the leaky aquifer function of Hantush and Jacob. These infinite series are absolutely convergent and can be used to calculate values of the leaky aquifer function for all possible values of the arguments. Some example calculations were carried out. (Sims-ISWS)
W77-07156

LOCATION OF FREE SURFACE IN POROUS MEDIA,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
J. A. Liggett.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12851, p 353-365, April 1977. 7 fig, 6 ref, 3 append.

Descriptors: *Free surfaces, *Porous media, *Mathematical models, Equations, Numerical analysis, Boundaries(Surfaces), Groundwater movement, Water table, Steady flow, Unsteady flow, Permeability, Seepage.
Identifiers: Boundary integral equation method, Coefficient matrices.

The boundary integral equation method (BIEM) was applied to the problem of locating the free surface in both steady and unsteady flow through porous media. The method is numerical in its application and uses boundary data only. Thus, the position of the free surface can be found without solving the complete flow problem. The method can be continued to find the solution to the complete problem. The method is especially efficient when the solution is desired at a limited number of points (e.g., on a failure surface in determining slope stability) or in a limited area of the flow. Examples were given in which there is a free surface and a seepage surface and in which zones of different permeability appear. (Visocky-ISWS)
W77-07162

SUBSIDENCE: SETTLING DOWN WITHIN THE LAWS OF ACCRETION, RELICTION, EROSION, AND SUBMERGENCE,
For primary bibliographic entry see Field 6E.
W77-07238

PRELIMINARY MAPS SHOWING GROUNDWATER RESOURCES IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07478

ANALOG-MODEL ANALYSIS OF REGIONAL THREE-DIMENSIONAL FLOW IN THE GROUND-WATER RESERVOIR OF LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y. Water Resources Div.
R. T. Getzen.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $1.35. Professional Paper 982, 1977. 49 p, 40 fig, 4 tab, 58 ref.

Descriptors: *Analog models, *Groundwater movement, *Aquifer characteristics, *Model studies, Hydrogeology, Groundwater recharge, Seepage, Surface-groundwater relationships, Analytical techniques, Regression analysis, Hydraulic conductivity, Specific yield, New York.
Identifiers: *Long Island(NY), Three-dimensional flow.

A three-dimensional analog model of the groundwater system beneath Long Island, N.Y., provides a practical means for studying anisotropic flow on a regional scale. Constructional and operational techniques influence the simulation almost as much as model design does. Usefulness and accuracy of the model depend on (1) inherent and practical limitations of the finite-difference method, (2) accuracy and completeness of the data base, and (3) accuracy of the assumptions and approximations that were made in applying the simulation technique to this particular ground-water reservoir. Reliable data used in design of the model are (1) horizontal hydraulic conductivity and thickness of three major aquifers, (2) extent of confining beds, (3) specific yield, and (4) locations of streams. Estimates of vertical hydraulic conductivity and specific storage were applied to the model. Most spatially fixed model boundaries are good representations of prototype (real-world) boundaries. Most dynamic boundaries are only approximately represented, and some dynamic boundaries require application of unproved assumptions. The simulated ground-water reservoir generally agrees with prototype hydrology, and the model is being used for predictive studies. (Woodard-USGS)
W77-07479

MAJOR AQUIFERS IN DEUEL AND HAMLIN COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07483

GROUND-WATER LEVELS IN MASSACHUSETTS, 1936-74,
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07485

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1973-77,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07486

CHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07487

CONVECTIVE HEAT FLOW FROM HOT SPRINGS IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07488

GEOCHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07489

WATER MOVEMENT IN SOIL FROM TRICKLE SOURCE,
Utah State Univ., Logan. Dept. of Agriculture and Irrigation Engineering.
For primary bibliographic entry see Field 2G.
W77-07550

2G. Water In Soils

HORIZON HYDRAULIC CONDUCTIVITIES DETERMINED IN SITU FOR THE WILDERNESS, MEXICO AND MENFRO SOILS AND USED TO PREDICT SOIL WATER CONTENT,
Missouri Univ.-Columbia. Dept. of Agronomy.
J. C. Doll.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 339, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. dissertation, December 1976. 180 p, 47 fig, 14 tab, 60 ref, 2 append. OWRT B-005-MO(3), B-022-MO(3), 14-01-0001-556- 1845 and 3025.

Descriptors: *Limestone, Soils, Seismographs, Soil types, *Soil water, *Hydraulic conductivity, *Soil properties, Evapotranspiration.
Identifiers: *Soil matrix potential, Wilderness soils, Mexico soils, Menfro soils.

The interrelationships between hydraulic conductivity, soil matrix potential and soil water content were determined by in situ methods for a fragipan soil of the Wilderness series, a claypan soil of the Mexico series and a deep loess soil of the Mexico series. Hydraulic properties of a draining profile were determined by the instantaneous profile method. Hydraulic properties of a wetting profile were determined by the crust infiltration method for the Mexico and Menfro soils. The hydraulic conductivity values determined by both methods compared favorably when examined at a given matrix potential. Hydraulic conductivities decreased sharply as the soil dried from saturation. The hydraulic conductivity of all horizons in all soils approached a value of 0.01 cm/day. This supports the use of a field capacity definition based upon an hydraulic conductivity of 0.01 cm/day. The measured hydraulic properties of the Menfro soil were used in a soil-plant-atmosphere model (Saxton, 1974) to predict seasonal soil water content. The predicted amounts of soil water and evapotranspiration were compared with measured seasonal amounts of soil water at a forested Menfro site and with evapotranspiration estimated by the method of Thornthwaite and Mather. The model prediction of actual evapotranspiration computed by Thornthwaite's method (assumed to be equal to actual evapotranspiration at the forested Menfro site) was 127.32 cm for the same 18 month period. Close agreement was found between the observed and predicted time distribution of total amounts of water in the soil.
W77-07103

THE EFFECT OF THE USE OF PESTICIDES AND FERTILIZERS IN THE WATER PROTECTION ZONE WITH SOURCES OF ARTIFICIAL REPLENISHMENT OF UNDERGROUND WATER RESERVES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 5B.
W77-07107

VARIATIONS IN THE LEAD, ZINC AND CALCIUM CONTENT OF DENDROBAENA RUBIDA (OLIGOCHAETA) IN A BASE METAL MINING AREA,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-07135

NITROGEN CONTAMINATION SOURCES IN SHALLOW GROUND WATER, LAS VEGAS AREA, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 5B.
W77-07141

SOLUTION OF EQUATION FOR TWO-DIMENSIONAL INFILTRATION PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
G. Zyvoloski, J. C. Bruch, Jr., and J. M. Sloss.
Soil Science, Vol. 122, No. 2, p 65-70, August 1976. 2 fig, 15 ref. (Calif WRC Project UCAL-WRC-W-336). OWRT A-039-CAL(14).

Descriptors: *Infiltration, *Soil water movement, *Equations, Soil physical properties, Diffusivity, *Finite element analysis, Numerical analysis, Capillary conductivity, Moisture content, Loam, Silts, Trenches, Soils, Unsteady flow, Unsaturated flow, Shape, Boundaries(Surfaces), Mathematical studies, Algorithms.
Identifiers: Galerkin method, Time steps, Iteration, Wetting front.

A finite element, weighted residual, successive substitution algorithm was used to solve two-dimensional infiltration problems whose governing partial differential equation and boundary conditions are highly nonlinear. The results compared favorably with other published numerical solutions to similar examples. The soil water diffusivity, as well as the capillary conductivity, were approximated within a finite element in terms of shape functions and discretized values of these functions calculated using guessed values or previously calculated values at a certain time level of the water content at the nodes. This successive substitution scheme converged rapidly within each time step. The method is general and can be extended to three-dimensional flows and the use of higher order approximations. (Visocky-ISWS)
W77-07142

NON-EQUILIBRIUM THERMODYNAMICS OF GROUNDWATER FLOW SYSTEMS: SYMMETRY PROPERTIES OF PHENOMENOLOGICAL COEFFICIENTS AND CONSIDERATIONS OF HYDRODYNAMIC DISPERSION,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W77-07143

SUCTION HEAD AT WET FRONT IN UNSATURATED-FLOW PROBLEMS--A NEW DEFINITION,
Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
J. T. Panikar, and G. Nanjappa.
Journal of Hydrology, Vol. 33, No. 1/2, p 1-14, March 1977. 9 fig, 3 tab, 21 ref.

Descriptors: *Soil moisture, *Infiltration, *Model studies, Mathematical models, Analytical techniques, *Soil water movement, Soil water, Soils, Graphical analysis, Soil properties, Moisture content, Equations, Unsaturated flow.
Identifiers: *Suction head, Wet front, Richards equation, Green-Ampt model.

Richard's equation governs the soil moisture movement in the unsaturated zone. However, practical difficulties in using the equation are the

nonavailability of soil properties and excessive computer costs. The Green-Ampt approach has been found to hold a promise of being used as a good approximation to Richards' equation. The suction head at wet front is the important information that is needed in the use of the Green-Ampt equation. Mein and Larson have defined S sub av for this purpose. The validity of this definition was discussed. The suction head at the wet front was re-defined and denoted as S sub ig x S sub av (theta) sub*, and S sub ig (theta) sub * was compared for a typical clayey soil. The variation of S sub ig with moisture content was shown graphically for five soils. The conditions favorable for application of the Mein-Larson model were identified. (Sims-ISWS)
W77-07144

AUTOMATIC MONITORING OF SOIL MOISTURE CONDITIONS IN A HILLSLOPE SPUR AND HOLLOW,
Bristol Univ., (England). Dept. of Geography.
M. G. Anderson, and T. P. Burt.
Journal of Hydrology, Vol. 33, No. 1/2, p 27-36, March 1977. 6 fig, 6 ref.

Descriptors: *Soil moisture, *Tensiometers, *Automation, Soil water, Slopes, Soil water movement, Runoff, Base flow, Instrumentation, On-site investigations, Hydraulic conductivity, Unsaturated flow, Storms, Precipitation(Atmospheric), Rainfall, Topography, Hydrology, Foreign research.
Identifiers: *England.

An automatic recording tensiometer system was designed and installed to record the spatial variation of soil moisture in a hillslope spur and hollow. Results were presented which demonstrate the significant control of topography on soil moisture conditions and the resulting stream flow response. From the storm event examined and the month-long recession which followed, the hillslope hollow was shown to be significant in both generating a throughflow peak in stream discharge and in maintaining the subsequent base flow. (Sims-ISWS)
W77-07146

WATER FLUX IN SOIL AND SUBSOIL ON A STEEP FORESTED SLOPE,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
R. D. Harr.
Journal of Hydrology, Vol. 33, No. 1/2, p 37-58, March 1977. 8 fig, 3 tab, 45 ref. NSF GB-38610X.

Descriptors: *Soil water movement, *Slopes, *Forests, *Oregon, On-site investigations, Soils, Soil properties, Soil water, Infiltration, Flow, Unsaturated flow, Tensiometers, Piezometers, Precipitation(Atmospheric), Runoff, Streamflow, Subsurface flow, Subsurface runoff, Subsurface waters, Storms, Subsoil.

Soil analyses and tensiometer, piezometer, and precipitation data were used to evaluate water flux in soil and subsoil on a steep forested slope. Although unsaturated flow predominated in the soil during fourteen moderate-size winter storms, discontinuous saturation of upslope subsoil did occur at depths of 110-150 cm after at least 30 mm of rain fell in 12 h or less. This saturation persisted les than 20 h. Very slight changes in soil water pressure head during storms effected relatively large changes in both magnitude and direction of water flux. Maximum water fluxes in the top meter of soil were 3-4.5 mm/h, and maximum flux in the subsoil was 0.5 mm/h, slightly less than the minimum flux in the soil. Between storms, the vertical component of flux at the 10-cm depth was much less than the downslope component, but the component of flux equaled the downslope component during storms. Conversely, vertical components of flux at 70- and 130-cm depths were much less than downslope components during storms, but the vertical components equaled downslope components between storms. Analysis of piezometric levels, discharge from a seep, and streamflow revealed an abrupt decrease in rate of water flux to the lower part of the slope about 10 h after the end of rainfall. This decrease corresponded with nearly complete draining of larger pores that had filled with water during storms. Subsurface flow and channel interception averaged 97 and 3% of storm flow which, in turn, averaged 38% of total storm precipitation. No overland flow was observed. (Sims-ISWS)
W77-07147

INTERCONNECTION OF SURFACE AND UNDERGROUND WATER RESOURCES IN SOUTHEAST DURHAM,
Teesside Polytechnic, Middlesborough (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 4B.
W77-07149

THE EFFECT OF SOIL MOISTURE ON CIRCULATION AND RAINFALL IN A TROPICAL MODEL,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W77-07166

STUDY OF THE STATE OF WATER ON THE SURFACE OF H+, NA+, MG2+ SATURATED KAOLINITE BY THE NMR METHOD, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
A. D. Voronin, V. F. Babanin, V. I. Malinovskii, and Y. E. Shapiro.
Pochvovedenie 4, p 156-160, 1976.

Descriptors: *Kaolinite, *Soil analysis, *Cation exchange, Ion exchange, Hydrogen, Ions, Magnesium, Sodium, Analytical techniques, Soil chemistry, Soil surfaces.
Identifiers: *Hydrogen ions, *Magnesium ions, *Sodium ions, *Nuclear magnetic resonance.

Five water retention zones (in the soil) were detected in suspensions of cation-substituted forms of kaolinite by the NMR method. The state of combined water depends on the type of exchangeble cations. Na+ and H+ demonstrate similar effects in the region of low concentrations: in the high concentration region similar effects are exerted by Mg2+ and H+.--Copyright 1977, Biological Abstracts, Inc.
W77-07241

ENTEROVIRUS AND BACTERIOPHAGE INACTIVATION IN SUBSURFACE WATERS AND TRANSLOCATION IN SOIL,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-07283

WATER MOVEMENT IN SOIL FROM TRICKLE SOURCE,
Utah State Univ., Logan. Dept. of Agriculture and Irrigation Engineering.
A. Y. Hachum, J. F. Alfaro, and L. S. Willardson.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12204, p 179-192, June 1976. 9 fig, 3 tab, 10 ref.

Descriptors: *Groundwater movement, *Flow, *Deep percolation, *Irrigation, *Seepage, *Water sources, Design, Loam, Silts, Equations, Soils, Water distribution(Applied).
Identifiers: *Trickle irrigation.

A two-dimensional water movement within a homogeneous soil profile from a surface water line source was investigated. In the experiment, various trickle water application rates were used to irrigate two types of soil. The effect of soil type and water application rate on the movement and distribution of water within the soil profile were considered. The experiment revealed that for the same volume of water, the vertical penetration of wetting front decreased and the horizontal water movement increased as the water application rate increased. The water movement in the horizontal and vertical directions was described by an exponential equation and the two-dimensional wetting pattern in the soil profile was approximated by a semiellipse without a significant loss of accuracy. A general mathematical consideration, utilizing the results of the present work for designing a tricle irrigation system is presented. A simple field test for obtaining system design parameters is described. (Bell-Cornell)
W77-07550

SOLUTIONS TO GREEN-AMPT INFILTRATION EQUATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07553

2H. Lakes

CAGE CULTURE OF CHANNEL CATFISH IN A HEATED EFFLUENT FROM A POWER PLANT, THOMAS HILL RESERVOIR,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-07101

ASPECTS OF RESERVOIR-POWER STATION INTERACTIONS: SOME EFFECTS OF HEAT ON PHYSICO-CHEMISTRY, AUFWUCHS ECOLOGY AND PLANKTON METABOLISM,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-07102

THE FORMATION OF A LOCAL POPULATION OF BREAM ABRAMIS BRAMA ORIENTALIS, IN THE HEATED WATER ZONE OF KONAKOVO POWER STATION,
Vserossiiskii Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khozyaistva, Konakovo (USSR). Upper Volga Div.
For primary bibliographic entry see Field 5C.
W77-07105

RESPONSES TO ODORS BY FINGERLING CUTTHROAT TROUT FROM YELLOWSTONE LAKE,
Western Illinois Univ., Macomb. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-07111

OBSERVATIONS ON A PEAT BOG'S ABILITY TO WITHSTAND INCREASING PUBLIC PRESSURE,
University of Wales Inst. of Science and Technology, Cardiff.
For primary bibliographic entry see Field 5C.
W77-07139

FAR FIELD CIRCULATION VELOCITIES IN SHALLOW LAKES,
North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
J. C. Uzzell, Jr., and M. N. Ozisik.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12873, p 395-407, April 1977. 6 fig, 12 ref, 3 append.

Descriptors: *Circulation, *Environmental engineering, *Lakes, *Water circulation, *Mathematical models, Temperature, Model studies, Water pollution, Winds, Thermocline, Turbulent flow, *Forecasting.
Identifiers: *Three-dimensional model, *Steady-state circulation, Far field, Reverse flow, Wind circulation, Wind stresses.

A three-dimensional model was developed for the prediction of steady-state circulation induced by the discharges, wind stresses, and horizontal temperature gradients in the far field regions of shallow lakes. For the case of lakes having rectangular geometrics and uniform depth, explicit analytical solutions were presented for the velocity distribution. The results of the analysis showed that a negative temperature gradient along the lake in a given direction gives rise to a flow in the same direction at the upper layer of the lake and to a reverse flow at the lower layer. The circulations induced by horizontal temperature gradients could be as important as those generated by wind stresses. (Roberts-ISWS)
W77-07164

A NEW METHOD FOR PHYSICAL LIMNOLOGY--TRITIUM-HELIUM-3 AGES--RESULTS FOR LAKE ERIE, HURON, AND ONTARIO,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
T. Torgersen, Z. Top, W. B. Clarke, W. J. Jenkins, and W. S. Broecker.
Limnology and Oceanography, Vol. 22, No. 2, p 181-193, March 1977. 5 fig, 4 tab, 20 ref. NSF GB 36348, GA 33124.

Descriptors: *Tritium, *Helium, *Radioisotopes, *Great Lakes, *Lake Erie, *Lake Huron, *Lake Ontario, Lakes, Sampling, On-site data collections, Epilimnion, Hypolimnion, Annual turnover, Data processing, Limnology, Pollutant identification, Methodology.

A new method in physical limnology, based on the radioactive tracer tritium and its stable daughter product, 3He, was examined. The 3He produced by the in situ decay of tritium can be used to calculate an effective water mass age. These ages can then be used to estimate gas exchange rates, gas renewal at turnover, and vertical diffusivity in the epilimnion. (Sims-ISWS)
W77-07168

DISSOLVED HELIUM IN LAKES: URANIUM PROSPECTING IN THE PRECAMBRIAN TERRAIN OF CENTRAL LABRADOR,
McMaster Univ., Hamilton (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 5A.
W77-07174

TRANSPORTS IN LAKE SUPERIOR,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 5B.
W77-07176

FRAZIL--THE INVISIBLE STRANGLER,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate.
For primary bibliographic entry see Field 2C.
W77-07177

RESIDUES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) UNDETECTED IN LAKE TROUT AND CHINOOK SALMON FROM THE UPPER GREAT LAKES,
Fish and Wildlife Service, Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 5A.
W77-07187

PLANKTONIC INFUSORIA IN TWO LAKES OF THE GORKI OBLAST, (IN RUSSIAN),
Gorkii State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W77-07234

WATER QUALITY AND CHEMICAL MODELS,
Harvard Univ., Boston, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 5C.
W77-07246

ENCROACHMENTS ON NAVIGABLE LAKE.
For primary bibliographic entry see Field 6E.
W77-07264

ECOLOGICAL STUDIES OF THE BRUSSELS URBAN ECOSYSTEM: CONTRIBUTION 8. FIRST SURVEY OF THE HYDROBIOLOGY OF THE WOLUWE VALLEY IN BRUSSELS, (IN FRENCH),
Brussels Univ. (Belgium). Faculte des Sciences.
For primary bibliographic entry see Field 5C.
W77-07292

COMPARATIVE CHARACTERISTICS OF THE PARASITE FAUNA OF BREAM IN LAKES DUSIOS, OBELIJOS, SALVANTU AND GALSTAS, WHICH HAVE DIFFERENT THERMAL REGIMES, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
E. Y. Rautskis.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai 4, p 87-94, 1975.

Descriptors: *Fish parasites, Lakes, *Thermal water, Fish population, Shallow water.
Identifiers: Abramis-brama, *Bream parasites, USSR, *Lake Obelija(Lithuania SSR).

In 1971-1973, the bream (Abramis brama) of thermally shallow Lake Obelija (S. Lithuania) had parasitofauna more numerous (23 spp.) than other lakes studied. The same parasites were found in bream caught in thermally deep Lake Galstas. Bream parasitofauna were considerably less numerous (12 spp.) in thermally deep Lake Slavantas, where benthos is scarce. The paucity of bream parasitofauna (9 spp.) in thermally modestly deep Lake Dusia may be accounted for by the scarcity of bream population and its acclimitization there.--Copyright 1977, Biological Abstracts, Inc.
W77-07312

DISTRIBUTION THICKNESS AND CERTAIN PHYSICAL AND CHEMICAL PROPERTIES OF BOTTOM SEDIMENTS IN THE KIEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2J.
W77-07321

OBSERVATIONS ON BACTERIOLOGICAL CONDITIONS IN THE UPPER GREAT LAKES 1968-1974,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W77-07340

THERMAL AND ISOTOPIC STUDIES ON THE CRATER LAKES OF MONTICCHIO (LUCANIA, ITALY), (IN ITALIAN),
Bari Univ. (Italy). Istituto di Geodesia e Geofisica.
F. Mongelli, C. Panichi, and E. Tongiorgi.
Arch Oceanogr Limnol 18(2), p 167-188, 1975.

Descriptors: *Isotopic studies, Thermal water, *Oxygen isotopes, Sampling, *Thermal springs, Measurement, Lakes.
Identifiers: Crater lakes, *Oxygen-18, *Lake Piccolo(Italy).

The thermometric measurements and the isotopic composition of the O2 of Lake Piccolo water samples indicate that this lake is made up of 2 different water bodies. That nearest the surface shows strong variations in temperature (from 5-21C) and 18O content (delta 18O: from -6.7 to -5.5%) whereas in the deeper water the temperature increases progressively towards the lake bottom with an anomalous temperature gradient (2.5C in 20 m) and the isotopic composition remains considerably constant and more negative that the surface part delta 18O: from -9.5 to -.88%). The thermal and isotopic anomalies are interpreted as the result of the particular feeding of the lake itself, i.e., mainly from springs emerging from the lake bottom. The springs come from the Vulture slopes at heights of more than 900 m. Measurements carried out in Lago Grande show that the thermal and isotopic variations are similar to those of other Italian lakes.--Copyright 1977, Biological Abstracts, Inc.
W77-07392

PRIMARY PRODUCTION AND BIOMASS OF ALGAE POPULATIONS IN AN OLIGOTROPHIC LAKE IN THE FRENCH MASSIF CENTRAL, (IN FRENCH),
For primary bibliographic entry see Field 5C.
W77-07398

MINERALIZING MICROBIAL ACTIVITY IN LAKE FARO,
Messina Univ. (Italy). Instituto di Idrobiologia.
For primary bibliographic entry see Field 5C.
W77-07418

PRELIMINARY INVESTIGATIONS ON BIVALVES BIVALVIA OF THE DAM RESERVOIR AT GOCZALKOWICE,
Polish Academy of Science, Pszcyna. Lab. of Water Biology.
For primary bibliographic entry see Field 5C.
W77-07440

NITROGEN, PHOSPHORUS, PARTICULATE AND COLLOIDAL CARBON CONTENT OF SEDIMENTING SESTON OF A HARD-WATER LAKE,
For primary bibliographic entry see Field 5C.
W77-07441

SUCCESSION RATES IN LAKE PHYTOPLANKTON COMMUNITIES,
For primary bibliographic entry see Field 5C.
W77-07442

SPATIAL AND TEMPORAL CHANGES IN THE PRIMARY PRODUCTIVITY OF LAKE TAHOE, CALIFORNIA-NEVADA BETWEEN 1959 AND 1971,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W77-07443

A MODEL OF THE PHOSPHORUS CYCLE AND PHYTOPLANKTON GROWTH IN SKAHA LAKE, BRITISH COLUMBIA, CANADA,
For primary bibliographic entry see Field 5C.
W77-07445

PREDICTING THE IMPACTS OF PHOSPHORUS MANAGEMENT POLICIES ON THE EUTROPHICATION OF SKAHA LAKE, BRITISH COLUMBIA, CANADA,
For primary bibliographic entry see Field 5C.

W77-07446

SUB-THERMOCLINE BIOMASS CONCENTRATION DETECTED BY TRANSMISSOMETER IN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W77-07447

SYNERGISTIC EFFECTS OF PHOSPHATE AND MANGANESE ON GROWTH OF LAKE SUPERIOR ALGAE,
For primary bibliographic entry see Field 5C.
W77-07448

PLUTONIUM IN THE LAURENTIAN GREAT LAKES: COMPARISON OF SURFACE WATERS,
For primary bibliographic entry see Field 5C.
W77-07449

PHOTOSYNTHETIC RATES IN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W77-07450

LAKE RESTORATION THROUGH MECHANICAL HARVESTING OF AQUATIC VEGETATION,
For primary bibliographic entry see Field 5G.
W77-07451

INFLUENCE OF THE DRAINAGE BASIN ON THE EUTROPHICATION OF THE A-MESOTROPHIC LAKE PIASECZNO AND DIS-EUTROPHICATION OF THE POND LAKE BIKCZE,
Instytut Przyrodniczych Podstaw, Lublin (Poland). Produkeji Roslinnej AR.
For primary bibliographic entry see Field 5C.
W77-07452

EFFECT OF ZOOPLANKTON GRAZING ON PHOTOSYNTHETIC ACTIVITY AND COMPOSITION OF PHYTOPLANKTON,
For primary bibliographic entry see Field 5C.
W77-07453

THE VERTICAL DISTRIBUTION OF PLANKTON ROTIFERS IN A SMALL ALPINE LAKE WITH A SHARP OXYGEN DEPLETION (LUNZER OBERSEE),
For primary bibliographic entry see Field 5C.
W77-07456

COMPOSITION AND DYNAMICS OF THE BOTTOM ANIMALS IN THE LITTORAL ZONE OF DOJRAN LAKE, MACEDONIA,
For primary bibliographic entry see Field 5C.
W77-07457

PIGMENT CYCLE IN A NORTH GERMAN LAKE,
For primary bibliographic entry see Field 5C.
W77-07459

A SURVEY OF THE PHYSICAL AND CHEMICAL LIMNOLOGY OF LAKE TITICACA,
For primary bibliographic entry see Field 5C.
W77-07460

SEDIMENT RESPIRATION IN SIX ITALIAN LAKES IN DIFFERENT TROPHIC CONDITIONS,
For primary bibliographic entry see Field 5C.
W77-07461

MODELING THE ANNUAL THERMAL EVOLUTION OF MID-LATITUDE LAKES,
S. Outcalt, and P. Kilham.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1333-1338, 1975. 4 fig., 7 ref.

Descriptors: *Mathematical models, *Water temperature, *Diffusivity, *Thermal properties, Depth, *Temporal distribution, Equations, Annual, Model studies, Simulation analysis, Theoretical analysis, Mixing, *Lakes.

A model is given through which sophisticated simulations of freeze up-break of ice can be made and which requires only an initial thermal profile and minimal weather data. Analytical schemes frequently employed to generate thermal evolutionary histories from an initial temperature profile and from the sequence of surface temperature observations fail because the effective diffusivity includes density downmixing during the cooling portion of the year. In addition, the upper layers are mixed by the wind in the absence of ice cover. When the first depth derivative of temperature is constant at the computation node, then the second depth derivative would be zero, and the effective diffusivity would be infinite, as observed when the monthly mean depth-dependent thermal regimes of mid-latitude lakes are arrayed. To calculate the time and depth-dependent thermal diffusivity of lake water, finite difference equations are used, representing temperture depth, time, second depth derivative of temperature, depth extent of thermal disturbance, Fourier Modulus, node number, density temperature node at base of wind mixed region node at top of bottom sediment and absolute value of arg. The model was designed to operate from daily total solar radiation, cloud cover, air temperature, air relative humidity, and wind velocity. (Auen-Wisconsin)
W77-07462

POPULATION CHANGES IN THE AQUATIC FAUNA INHABITING THE BLADDERWORT, UTRICULARIA FLEXUOSA VAHL., IN A TROPICAL SWAMP, TASEK BERA, MALAYSIA,
For primary bibliographic entry see Field 5C.
W77-07465

SEASONAL VARIATION IN SEDIMENT-WATER EXCHANGE OF NUTRIENT IONS IN LAKE ESROM,
For primary bibliographic entry see Field 5C.
W77-07467

UPWELLING IN A MODEL OF AN INTERMONTANE LAKE,
For primary bibliographic entry see Field 5B.
W77-07469

AN ORGANIC CARBON BUDGET FOR AN OLIGOTROPHIC LAKE IN NEW HAMPSHIRE, U.S.A.,
For primary bibliographic entry see Field 5C.
W77-07470

ALGAL PRODUCTIVITY OF NATURAL AND ARTIFICIALLY ENRICHED FRESH WATERS IN MALAYA,
For primary bibliographic entry see Field 5C.
W77-07471

THE STRUCTURE OF PHYTOPLANKTON ASSOCIATIONS IN LAKE TAHOE (CALIFORNIA-NEVADA),
For primary bibliographic entry see Field 5C.
W77-07473

AREAL DISTRIBUTION AND STRATIGRAPHY OF DIATOMS IN THE SEDIMENTS OF LAKE SALLIE, MINNESOTA,
Geological Survey, Lakewood, Colo. Water Resources Div.; and Geological Survey, Denver, Colo. Geologic Div.
For primary bibliographic entry see Field 5C.
W77-07481

WIND CONTROL OF ALGAE GROWTH IN EUTROPHIC LAKES,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5G.
W77-07497

PRELIMINARY ESTIMATES OF PRODUCTION BY A CALANOID COPEPOD IN SUBTROPICAL LAKE SIBAYA,
For primary bibliographic entry see Field 5C.
W77-07500

CHANGES IN PHYTOPLANKTON SPECIES COMPOSITION SINCE 1894 IN TWO LAKES IN EAST-HOLSTEIN, GERMANY,
For primary bibliographic entry see Field 5C.
W77-07501

THE EFFECT OF FOOD CONCENTRATION AND TEMPERATURE ON RESPIRATION AND EXCRETION IN HERBIVOROUS ZOOPLANKTON,
For primary bibliographic entry see Field 5C.
W77-07502

A SURVEY OF THE BIOLOGICAL LIMNOLOGY OF LAKE TITICACA,
For primary bibliographic entry see Field 5C.
W77-07503

LAKE IZABAL, GUATEMALA,
For primary bibliographic entry see Field 5C.
W77-07504

ANNUAL CONTRIBUTION OF CARBON, NITROGEN AND PHOSPHORUS BY MIGRANT CANADA GEESE TO A HARDWATER LAKE,
For primary bibliographic entry see Field 5C.
W77-07505

GRAZING EFFECTS ON NANNOPLANKTON IN GATUN LAKE, PANAMA,
For primary bibliographic entry see Field 5C.
W77-07507

ROLE OF OLIGOCHAETES IN THE CIRCULATION OF WATER AND SOLUTES ACROSS THE MUD-WATER INTERFACE,
For primary bibliographic entry see Field 5C.
W77-07508

SIMILARITIES AND DIFFERENCES IN THE CHEMICAL COMPOSITION OF WATERS FROM WEST, CENTRAL, AND EAST AFRICA,
For primary bibliographic entry see Field 5A.
W77-07510

SYMAP COMPUTER PROJECTIONS OF SUMMER ZOOPLANKTON POPULATIONS IN VAN LAKE, MONTANA,
For primary bibliographic entry see Field 7C.
W77-07511

ALGAL RESPONSE TO NUTRIENT INPUTS IN SOME IOWA LAKES,
For primary bibliographic entry see Field 5C.
W77-07515

THE RELEASE OF DISSOLVED ORGANIC CARBON FROM SUBMERSED AQUATIC MACROPHYTES: DIEL, SEASONAL AND COMMUNITY RELATIONSHIPS,
For primary bibliographic entry see Field 5C.
W77-07516

THE ROLE OF PHOSPHATE IN EUTROPHICATION. STIMULATION OF PLANKTON GROWTH AND RESIDENCE TIMES OF INORGANIC PHOSPHATE IN LAKE KINNERET WATER,
For primary bibliographic entry see Field 5C.
W77-07517

THE INFLUENCE OF SPRING CIRCULATION ON ZOOPLANKTON DYNAMICS IN THE PLUSSEE,
For primary bibliographic entry see Field 5C.
W77-07518

RESPONSE TO EUTROPHIC SHAGAWA LAKE, MINNESOTA, U.S.A., TO POINT-SOURCE, PHOSPHORUS REDUCTION,
For primary bibliographic entry see Field 5C.
W77-07519

MEROMIXIS IN ULMENER MAAR (GERMANY).
For primary bibliographic entry see Field 5C.
W77-07520

MATHEMATICAL MODELS OF STRONTIUM-90 BEHAVIOR IN 'WATER-FRESH WATER FISH SPAWN' SYSTEM FOR PARTICULAR CASES OF RADIOACTIVE CONTAMINATION OF RESERVOIRS, (IN RUSSIAN),
Institute of Radiation Health, Leningrad (USSR).
For primary bibliographic entry see Field 5C.
W77-07539

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
E. J. Pluhowski.
Transportation Engineering Journal of ASCE, Proceedings of the American Society of Civil Engineers, Vol. 102, No. TE3, Proceedings paper No. 12306, p 475-488, August 1976. 13 fig, 6 ref.

Descriptors: *Lake Ontario, *Remote sensing, *Currents, *Beach erosion, Lakes, Rivers, Turbidity, Hydrology, Monitoring, Outlets.
Identifiers: *Turbidity plumes.

Space imagery and high-altitude photography provide an effective method of monitoring the dynamics of turbidity plumes in Lake Ontario. The Niagara River Plume, as much as 200 sq miles (520 km) in area, is by far the largest turbidity feature in the lake. Plume analyses corroborate the presence of a prevailing eastward flowing longshore current along the entire south shore of the lake. This current is most persistent at the Oswego River outlet but it is quite variable in the Rochester embayment, where rapid shifts in water movement were occasionally detected. The position of the spring thermal bar, a zone of maximum density water corresponding in the 4 C isotherm, was located near the Niagara River outlet in images obtained during April, 1973. (Bell-Cornell)
W77-07549

SATELLITE OBSERVATIONS OF WATER QUALITY,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-07554

STUDIES ON THE TYPOLOGY OF BALTIC LAKES WITH DIFFERENT STATES OF EUTROPHICATION, (IN GERMAN),
For primary bibliographic entry see Field 5B.
W77-07576

LAKE RESTORATION BY BOTTOM WATER SIPHONING, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland).
For primary bibliographic entry see Field 5G.
W77-07577

MODELS FOR SIMULATION OF EUTROPHICATION OF LAKES FOR LAKE CONSTANCE (BODENSEE-OBERSEE): I. DATA FROM LAKE CONSTANCE USED IN SIMULATION MODELS, (IN GERMAN),
Baden-Wuerttemberg Landesanstalt Fuer Unweltschutz (West Germany). Inst. of Seenforschungs Fischereiwesen.
For primary bibliographic entry see Field 5C.
W77-07579

HEAVY METALS (FE, MN, CD, CR, CU, PB AND ZN) IN THE PELAGIC ZONE OF LAKE CONSTANCE (OBERSEE AND UNTERSEE) AND THE GREIFENSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5A.
W77-07580

A COMPARISON OF SPECTROPHOTOMETRIC METHODS FOR THE DETERMINATION OF PHYTOPLANKTON PIGMENTS, (IN FRENCH),
Biological Station, Besse-en-Chandesse (France).
For primary bibliographic entry see Field 5A.
W77-07581

MACROPHYTES AND PHOSPHORUS IN LAKE ANDSJON, CENTRAL SWEDEN, (IN SWEDISH),
For primary bibliographic entry see Field 5C.
W77-07582

FIRST INFORMATION ABOUT N, P NUTRIENTS AND THE PRODUCTION OF LAKE TRASIMENO, (IN ITALIAN),
Perugia Univ. (Italy). Istituto di Idrobiologia e Pescicultura.
For primary bibliographic entry see Field 5C.
W77-07593

PHYTOMICROBENTHOS OF THE KURTLI RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki.
For primary bibliographic entry see Field 5C.
W77-07596

2I. Water In Plants

ANNOTATED BIBLIOGRAPHY ON HYDROBIOLOGY AND HYDROCHEMISTRY OF THE KARA KUM CANAL 1955-74, (IN RUSSIAN),
E. S. Ataeva, and S. I. Kogan.
Izv Akad Nauk Turkm SSR Ser Biol Nauk 2, p 89-94, 1976.

Descriptors: *Hydrobiology, *Bibliographies, *Water chemistry, Canals.
Identifiers: *Kara-Kum Canal(Turkmen-SSR), USSR.

A list of 76 books, brochures and journal articles relating to the Kara Kum Canal, its associated reservoir and other areas in the Turkmen SSR (USSR) is given. The entries are arranged alphabetically according to authors and are accompanied by annotations except in the cases of these, oral reports and authors' abstracts. No non-Soviet entries are included. Some of the literature covers flora or fauna of the Kara Kum area.--Copyright 1977, Biological Abstracts, Inc.
W77-07540

2J. Erosion and Sedimentation

TRANSPORTS IN LAKE SUPERIOR,
Minnesota Univ., Duluth. Dept. of Physics.
For primary bibliographic entry see Field 5B.
W77-07176

SUBSIDENCE: SETTLING DOWN WITHIN THE LAWS OF ACCRETION, RELICTION, EROSION, AND SUBMERGENCE,
For primary bibliographic entry see Field 6E.
W77-07238

DISTRIBUTION THICKNESS AND CERTAIN PHYSICAL AND CHEMICAL PROPERTIES OF BOTTOM SEDIMENTS IN THE KIEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
I. A. Zapol'skii, and B. G. Es'kov.
Gidrobiol Zh 12(2), p 22-30, 1976.

Descriptors: *Distribution, *Bottom sediments, Reservoirs, *Sediment distribution.
Identifiers: Dreissensia, Paludian, USSR, Unio, *Kiev Reservoir(Ukranian SSR), *Sediment thickness.

In connection with the construction of the Kiev reservoir (Ukranian SSR, USSR) the water regime of the Dnieper (River) changed. This resulted in reformation of the bottom sediments. A survey of bottom sediments for the period of the reservoir's existence and rocks formed before its filling established variations in the sediment distribution. Considerable changes are observed in indexes of composition and properties of the sediments(Eh decrease, Ph increase, decrease in specific weight, growth in coefficients of porosity and maximum molecular moisture content). Plant remains and shells of Unio, Dreissensia and Paludinia in bottom sediments are mentioned.--Copyright 1976, Biological Abstracts, Inc.
W77-07321

WASSAW ISLAND EROSION STUDY. PART 1: SEDIMENTARY FRAMEWORK OF A CHANNEL MARGIN SHOAL OF AN EBB DELTA, WASSAW SOUND, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.; and Georgia Marine Science Center, Savannah.
For primary bibliographic entry see Field 2L.
W77-07324

THE DUNE BOOK. HOW TO PLANT GRASSES FOR DUNE STABILIZATION,
North Carolina State Univ. at Raleigh. Center for Marine and Coastal Studies.
J. Seltz.
North Carolina University Sea Grant Publication No. UNC-SG-76-16, December 1976. 16 p. SG-04-6-158-44054.

Descriptors: *Grasses, *Dunes, Sands, Sedimentation, Resources development, *North Carolina, Bank stabilization.
Identifiers: *Dune stabilization, Ammophila breviligulata, Uniola paniculate, Panicum amarum, Spartina patens, American beachgrass, Sea oats, Bitter panicum, Saltmeadow cordgrass.

Engineers have tried to copy nature by building dunes with bulldozers and dredges or by stringing long fences across the sand. A simpler, usually less expensive and often more successful method exists where blowing sand is available. By planting sand and sand-resistant grasses anyone (homeowners and developers, restaurant owners and motel keepers) can encourage the wind to slow and drop its load of sand, beginning the natural cycle of dune growth. A grass planting 40 to 50 feet wide can trap several cubic yards of blowing sand per foot of beach in a year. Four grasses meet the requirements in North Carolina: American beachgrass, Sea oats, Bitter panicum and Salt-meadow cordgrass. (NOAA)
W77-07326

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Center for Marine and Coastal Studies.
For primary bibliographic entry see Field 2L.
W77-07327

ACOUSTIC MEASUREMENT OF SEDIMENT TRANSPORT,
Canada Centre for Inland Waters, Burlington (Ontario).
C. K. Jonys.
Scientific Series No. 66, 1976, Ottawa, Canada, 118 p., 64 fig., 10 tab., 18 ref., 2 append.

Descriptors: *Acoustics, *Measurement, *Sediment transport, Research and development, Bed load, Sounding, Analysis, Underwater, Hydrophones, River beds, *Instrumentation, On-site tests, Laboratory tests, Theoretical analysis.
Identifiers: *Pebbles, Collision.

Three studies are combined on the acoustic method of sediment bed-load measurement in gravel-bearing rivers. Laboratory experiments were carried out to verify some acoustical aspects of impact noise in water for application in the development of a theoretical relationship between the noise generated by riverbed pebble collisions and bed-load transport rates. Underwater pebble noise was simulated by rolling ceramic balls on a bed of similar balls in a large laboratoy flume. Sound was measured with a stationary hydrophone located in the water above the pebble bed. Specific information was obtained on the interparticle collision frequency delineating the limit of transition from impact to continuous type of sound; the applicability of theoretical relationship in the determination of total sound pressure levels owing to impact sources; the acoustic directivity of pebble collision noise; the sound field characteristics surrounding pebble collision sources; the effect of pebble velocity on the generated sound pressure level; and the spectrum characteristics of the pebble collision generated noise. In field experiments, underwater sound samples were recorded in two gravel-bearing rivers during periods with and without bed-load movement. Also, samples of artificially generated interparticle collision noise by different sizes of gravel pebbles were recorded. Flow velocities and bed-load transport were measured as well. The purpose of the observations was to obtain field data for the study of the feasibility of the acoustic method for bed-load measurement.(WATDOC)
W77-07338

PROCEEDINGS OF THE SEVENTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
For primary bibliographic entry see Field 8D.
W77-07342

PROBLEMS ASSOCIATED WITH CONSTRUCTION OF SUBMARINE PIPELINES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07349

MATHEMATICAL MODELING OF SEDIMENTATION TRANSIENTS IN SAND-BED CHANNELS,
Colorado State Univ., Fort Collins, Engineering Research Center.
K. Mahmood, and V. M. Ponce.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 274, Price codes: A07 in paper copy, A01 in microfishe. Research Report No. CER75-76KM-VMP28, April 1976. 132 p, 17 fig, 12 ref, 3 append.

Descriptors: *Sediment transport, *Alluvial channels, *Computer models, Numerical analysis, *Mathematical models, Sedimentation, Streams, Stream erosion, Suspended load, Hydrology, Aggradation, Degradation.
Identifiers: *Sand-bed channels, Sedimentation transients, Sedimentation Courant number.

A mathematical model of sedimentation transients in straight alluvial channels was presented. A coupled solution of the momentum and sediment continuity equations enables the numerical solution with longer time steps than are possible for uncoupled models. The model solves the finite difference analog of the governing equations by a linerized implicit numerical scheme. The linerization imposes the limitation that for a time step Delta t the change in depth of flow Deta h/h be less than 0.10. Criteria were developed to assess the stability and cnvergence properties of the numerical scheme. Theoretically optimum values of the weighting factor delta and a sedimentation Courant number were presented. Results of test runs derived from hypothetical examples were presented. The numerical model effectively simulates the formation of a bed wave in the upstream reach of a straight alluvial channel due to a non-equilibrium sediment inflow hydrograph. Examples of various types of aggradation and degradation problems that can be simulated by the model were given. (Lee-ISWS)
W77-07354

EFFECT OF THE ASWAN HIGH DAM ON THE NILE FLOOD AND ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-07363

THE STABILITY DURING MANY YEARS OF THE MID-TIDAL SHORE AT PENRHYN BAY, NORTH WALES, AND A NOTE ON THE PEAT BEDS AT RHOS-ON-SEA,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 2L.
W77-07367

PREDICTABILITY OF EFFECTS OF A SEVERE LOCAL STORM IN PENNSYLVANIA,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2B.
W77-07369

EFFECT OF SILT AND SALINITY ON THE MORTALITY OF MERETRIX LUSORIA (ROEDING), (IN KOREAN),
Pusan National Univ. (Republic of Korea).
For primary bibliographic entry see Field 5C.
W77-07428

NITROGEN, PHOSPHORUS, PARTICULATE AND COLLOIDAL CARBON CONTENT OF SEDIMENTING SESTON OF A HARD-WATER LAKE,
For primary bibliographic entry see Field 5C.
W77-07441

EXPERIMENTAL SEDIMENT ADDITION STUDIES ON THE HARRIS RIVER, N.W.T., CANADA: THE EFFECT ON MACROINVERTEBRATE DRIFT,
For primary bibliographic entry see Field 5C.
W77-07455

SEDIMENT RESPIRATION IN SIX ITALIAN LAKES IN DIFFERENT TROPHIC CONDITIONS,
For primary bibliographic entry see Field 5C.
W77-07461

TRIPTON SEDIMENTATION IN EUTROPHIC LAKES--SAMPLE CORRECTION FOR THE RESUSPENDED MATTER,
For primary bibliographic entry see Field 5C.
W77-07463

ALGAL SEDIMENTATION: THE CAUSE OF A DIATOM-BLUE-GREEN SUCCESSION,
For primary bibliographic entry see Field 5C.
W77-07464

POST-GLACIAL HISTORY OF MIRROR LAKE AND ITS WATERSHED IN NEW HAMPSHIRE, U.S.A.: AN INITIAL REPORT,
For primary bibliographic entry see Field 5C.
W77-07472

AREAL DISTRIBUTION AND STRATIGRAPHY OF DIATOMS IN THE SEDIMENTS OF LAKE SALLIE, MINNESOTA,
Geological Survey, Lakewood, Colo. Water Resources Div.; and Geological Survey, Denver, Colo. Geologic Div.
For primary bibliographic entry see Field 5C.
W77-07481

RECONNAISSANCE OF SEDIMENT TRANSPORT AND CHANNEL MORPHOLOGY IN THE LOWER RIO BERMEJO BASIN, ARGENTINA--WITH A SECTION ON RECONNAISSANCE OF THE LOWER RIO PILCOMAYO BASIN, ARGENTINA AND PARAGUAY,
Geological Survey, Harrisburg, Pa. Water Resources Div.
J. R. Ritter.
Open-file report 76-564, 1977. 41 p, 18 fig, 1 plate, 6 tab, 16 ref.

Descriptors: *Sediment transport, *Streamflow, *Sediment yield, *Channel morphology, *South America, Stream erosion, Alluvial channels, Sediment load, Sediment control, Evaluation.
Identifiers: *Argentina, *Lower Rio Bermejo basin(Arg-Para), *Paraguay, *Lower Rio Pilcomayo basin(Arg).

Sediment transport conditions are described for the Lower Rio Bermejo and the Rio Pilcomayo in the Gran Chaco region of northern Argentina and southern Paraguay. The Lower Rio Bermejo is in many ways atypical, as its channel narrows downstream. Also its flow decreases downstream even though average annual rainfall at its mouth is twice that at its head (1,200 mm vs. 600 mm) and its suspended-sediment at El Yacare was about 41 million metric tonnes per year during 1970-73 and 82 million metric tonnes per year at El Colorado. The Rio Pilcomayo 'Superior' disappears near Laguna Escalante, owing to plugging of its channel by sediment, into a network of shallow lakes and marshes. Another stream known as the Rio Pil-

comayo 'Inferior' appears about 160 km to the southeast and meanders downstream to the Rio Paraguay. The Rio Pilcomayo 'Superior' carries about 100 million metric tonnes of sediment per year. The average annual concentration of sediment is more than 6 kg per cubic meter of flow. (Woodard-USGS)
W77-07490

2K. Chemical Processes

INTERACTIONS OF CUPRIC ION WITH HUMIC ACID,
Missouri Univ. Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-07104

STUDY OF THE STATE OF WATER ON THE SURFACE OF H+, NA+, MG2+ SATURATED KAOLINITE BY THE NMR METHOD, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-07241

DYNAMICS OF O2 AND CO2 EXCHANGE, PHOTOSYNTHESIS, AND RESPIRATION IN RIVERS FROM TIME-DELAYED CORRELATIONS WITH IDEAL SUNLIGHT,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07364

CHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
L. M. Willey, J. R. O'Neil, and J. B. Rapp.
Open-file report, January 1974. 19 p, 1 fig, 6 tab, 13 ref.

Descriptors: *Geothermal studies, *Thermal water, *Chemical analysis, *Temperature, *California, Data collections, Methodology, Energy, Water chemistry, Geochemistry, Water types, Alkaline water.
Identifiers: Mono County(Calif), Probable energy sources, Geothermometers, *Long Valley(Calif).

Exploration for geothermal energy in the Long Valley area of Mono County, California, the site of a major collapse caldera, began in 1959. Since then the area has been the subject of intensive studies to determine its potential for geothermal power. In 1972, ground waters were sampled to study the hydrogeochemistry of the area, utilizing the most advanced techniques available to insure accurate chemical analysis. The waters are either a sodium bicarbonate or sodium chloride bicarbonate type. Relatively high values for chloride indicate that the thermal waters probably are part of a hot-water rather than a vapor-dominated hydrothermal system. Subsurface temperatures were calculated using six different geochemical methods. (Woodard-USGS)
W77-07487

CONVECTIVE HEAT FLOW FROM HOT SPRINGS IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
M. L. Sorey, and R. E. Lewis.
Journal of Geophysical Research, Vol 81, No 5, p 785-791, February 10, 1976. 3 fig, 4 tab, 23 ref.

Descriptors: *Geothermal studies, *Thermal springs, *Water chemistry, *California, Water temperature, Hot springs, Flow rates, Analytical techniques, Geochemistry, Correlation analysis, Heat flow, Boron.
Identifiers: *Long Valley Caldera(Calif).

The heat discharged by the hot spring system in Long Valley, California, has been estimated from measured spring discharges by using geochemical mixing models. Of the total flow of 1300 liter/s from 11 thermal springs in the caldera, approximately 20% or 150 liter/s is contributed by the hydrothermal system at depth with temperatures near 210 C. The effects of heat loss by conductive cooling, mixing, and boiling are quantified for the springs in Hot Creek Gorge, which are the major source of hot water discharge in the caldera. The estimated total convective heat discharge is 4.3 x 10 to the 7th power cal/s, which is in agreement with an estimate obtained from the rate of boron discharge from the caldera into Lake Crowley. (Woodard-USGS)
W77-07488

GEOCHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. H. Mariner, and L. M. Willey.
Journal of Geophysical Research, Vol 81, No 5, p 792-800, February 10, 1976. 8 fig, 6 tab, 27 ref.

Descriptors: *Geochemistry, *Geothermal studies, *Thermal springs, *Chemical analysis, *Water temperature, Water chemistry, Evaluation, Chemical reactions, Dissolved solids, *California.
Identifiers: Mono County(Calif), *Long Valley(Calif), Geothermometer.

Thermal springs and wells in Long Valley, California, issue sodium bicarbonate-chloride waters containing 1000-1420 mg/liter of dissolved solids. Thermal waters of sodium bicarbonate-chloride composition are usually associated with hot-water reservoirs. Chloride concentrations and stable isotope data indicate that the thermal waters have had varied histories. All of the thermal springs issue a mixture of fluid from the thermal reservoir and less saline, cooler water from one or more shallow aquifers. The composition of springs in Hot Creek Gorge may have been further altered by minor subsurface boiling. Thermal springs between Hot Creek and Lake Crowley issue mixtures of fresh and thermal waters which have lost heat by conductive cooling and changed composition by reaction with rock in the shallow aquifer. The silica content of water from Magma Richie 5 and mixing calculations based on the concentrations of silica in thermal waters collected from springs in Hot Creek Gorge and along Little Hot Creek indicate a temperature of at least 200 degrees C in the thermal reservoir. The sodium-potassium-calcium geothermometer yields a reservoir temperature estimate near 200 degrees C for most of the thermal springs. If geothermal energy is developed in Long Valley, the high concentrations of arsenic (up to 2.2 mg/liter), boron (up to 15 mg/liter), and total dissolved solids in the thermal fluids will make it necessary to isolate the effluent of production wells from the freshwater system. (Woodard-USGS)
W77-07489

2L. Estuaries

ROLE OF MUSSELS MYTILUS EDULIS IN REMOVAL OF PETROLEUM PRODUCTS FROM SEAWATER (UNDER EXPERIMENTAL CONDITIONS),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
For primary bibliographic entry see Field 5C.
W77-07116

THE UTILIZATION OF DISSOLVED FREE AMINO ACIDS BY ESTUARINE MICROORGANISMS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07117

COMPARISON OF ARTIFICIAL AND NATURAL SEA WATER AS CULTURE MEDIA FOR JUVENILE LOBSTERS,
California Univ., Davis. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W77-07118

OCCURRENCE OF TOXIC BIVALVES IN ASSOCIATION WITH THE BLOOM OF GONYAULAX SP. IN OWASE BAY,
Tokyo Univ. (Japan). Lab. of Marine Biochemistry.
For primary bibliographic entry see Field 5C.
W77-07119

USE OF QUICKLIME TO INCREASE OYSTER SEED PRODUCTION,
National Marine Fisheries Service, Highland, N.J. Sandy Hook Lab.
For primary bibliographic entry see Field 5C.
W77-07122

SHELL DEFORMITY AMONG SCALLOPS (ARGOPECTEN IRRADIANS LAMARK) CULTURED IN A RECIRCULATING SEAWATER SYSTEM,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W77-07123

THE DYNAMICS OF METALS IN THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA. II. ENVIRONMENTAL EFFECTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.
For primary bibliographic entry see Field 5C.
W77-07129

EFFECTS OF PASSAGE THROUGH POWER PLANT COOLING SYSTEMS ON ESTUARINE COPEPODS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 5C.
W77-07134

EFFECTS OF BENZENE (A TOXIC COMPONENT OF PETROLEUM) ON SPAWNING PACIFIC HERRING, CLUPEA HARENGUS PALLASI,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
For primary bibliographic entry see Field 5C.
W77-07137

RED TIDE IN THE UPWELLING REGION OF BAJA CALIFORNIA,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
For primary bibliographic entry see Field 5C.
W77-07169

THE ECOLOGICAL CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART I: ECOLOGICAL STUDIES,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 5C.
W77-07178

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART II. CHEMICAL STUDIES,
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07179

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART III: HISTOPATHOLOGICAL STUDIES,
National Water Quality Lab., West Kingston, R. I.
For primary bibliographic entry see Field 5C.
W77-07180

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS I. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIERS FOR SOME MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07181

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-II. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIER COMPONENTS FOR MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07182

THE DISTRIBUTION AND ECOLOGY OF COMMON MARINE AND ESTUARINE GASTROPODS IN THE DELAWARE BAY AREA,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W77-07185

ACUTE TOXICITY OF ZINC, CADMIUM, AND CHROMIUM TO THE MARINE FISHES, YELLOW-EYE MULLET (ALDRICHETTA FORSTERI C. AND V.) AND SMALL MOUTHED HARDYHEAD (ATHERINASOMA MICROSTOMA WHITLEY),
Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.
For primary bibliographic entry see Field 5C.
W77-07190

HEAVY METAL POLLUTION IN TRONDHEIMSFJORDEN, NORWAY, AND THE RECORDED EFFECTS ON THE FAUNA AND FLORA,
Kongelige Norske Videnskabers Selskab, Trondheim. Museet.
For primary bibliographic entry see Field 5C.
W77-07194

OFFSHORE OIL AND FISHERY RESOURCES,
New York State Dept. of Environmental Conservation, Delmar. Div. of Marine and Coastal Resources.
For primary bibliographic entry see Field 5C.
W77-07195

RESPONSES OF THE LICHENS PELTIGERA APHTHOSA AND CETRARIA NIVALIS AND THE ALGA NOSTOC COMMUNE TO SULFUR DIOXIDE, NATURAL GAS, AND CRUDE OIL IN ARCTIC ALASKA,
Louisville Univ., Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07197

SUBTIDAL AND INTERTIDAL MARINE FOULING ON ARTIFICIAL SUBSTRATA IN NORTHERN PUGET SOUND, WASHINGTON,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07201

UPTAKE, DISTRIBUTION, AND DEPURATION OF 14C-BENZENE IN NORTHERN ANCHOVY, ENGRAULIS MORDAX, AND STRIPED BASS, MORONE SAXATILIS,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
For primary bibliographic entry see Field 5C.
W77-07202

ENVIRONMENTAL DEPENDENCE OF MANGANESE AND ZINC IN THE SCALES OF ATLANTIC SALMON, SALMO SALAR (L) AND BROWN TROUT, SALMO TRUTTA (L),
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-07203

POLLUTION SUSCEPTIBILITY: AN ENVIRONMENTAL PARAMETER FOR COASTAL ZONE MANAGEMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5G.
W77-07230

FEDERAL RIVERBASIN PLANNING IN THE COASTAL ZONE: THE LONG ISLAND SOUND STUDY,
Yale Univ., New Haven, Conn. School of Forestry and Environmental Studies.
L. C. Irland.
Coastal Zone Management Journal, Vol 2, No 3, p 247-72, 1976. 4 fig, 21 ref.

Descriptors: *Water Resource Planning Act, *Governmental interrelations, *Institutional constraints, *Federal project policy, Interagency cooperation, Administration, Multiple-purpose projects, Water management(Applied), Long term planning, Project planning, Planning, Regional development, Interstate, Federal government, Local governments, State governments, Management.
Identifiers: *Coastal zone management, *Coastal waters, *Long Island Sound Study, Water planning, Coastal zone, Coastal zone planning.

Coastal zone planning has been attempted through a variety of institutional systems. The Long Island Sound Study (LISS) is an important case study in federal water planning in coastal zones because it illustrates the limitations imposed on planning by the traditional multiagency committee format, as well as the weaknesses in traditional planning concepts. The LISS was successful to the extent that it went beyond the traditional water planning process in areas such as local involvement and public participation, but because of the framework of established pattern of riverbasin planning, it was unable to go far enough. The existing riverbasin planning approach needs to be adjusted to adapt to administrative and political realities in the coastal zone. Planning efforts for coastal zone management should emphasize state leadership, since implementation is largely state responsibility. In addition, current approaches of basing plans on projected demands must be abandoned in favor of a system based on description and analysis of alternatives. (Petruff-Florida)
W77-07232

PROPERTY-COASTAL SHORES-PRIVATE PROPERTY RIGHTS UPHELD OVER CLAIMED PUBLIC RIGHT TO RECREATIONAL USE OF BEACH-IMPLIED DEDICATION, EASEMENT BY PRESCRIPTION, PUBLIC TRUST THROUGH CUSTOM AND GRANT, AND DOCTRINE OF SUBMERGENCE NOT APPLICABLE. DEPARTMENT OF NATURAL RESOURCES V. MAYOR AND COUNCIL OF OCEAN CITY, 274 MD. 1, 332 A.2D 630 (1975).
For primary bibliographic entry see Field 6E.
W77-07239

ATOMIC ABSORPTION MEASUREMENTS OF LEAD, CADMIUM, COPPER, IRON, AND ZINC IN SESTON OF THE BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5A.
W77-07309

PCB CONTENTS IN THE MUSCLE OF MARINE ANIMALS COLLECTED IN THE SEA NEAR HAKODATE (IN JAPANESE),
Hokkaido Univ., Hakodate (Japan). Lab. of Food Hygiene.
For primary bibliographic entry see Field 5C.
W77-07315

PRELIMINARY EXPERIMENT OF COBALT 60 POLLUTION OF A MARINE FOOD CHAIN: RESULTS OF A SINGLE INGESTION,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Departement de Protectione; CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Service de Recherches Toxicologiques et Ecologiques; and CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Laboritorie de Radioecologie Continental.
For primary bibliographic entry see Field 5C.
W77-07317

NUTRIENT TRANSFORMATIONS IN LOUISIANA SALT MARSH SOILS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 5C.
W77-07319

CIRCULATION AND SURGE MODELING IN PAMLICO SOUND, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
M. Amein, and D. S. Airan.
Sea Grant Reprint No. 100, Reprinted from: Proceedings of ASCE National Water Resources and Ocean Engineering Convention held San Diego, California, April 5-8, 1976. Preprint No. 2665. 32 p, 12 fig, 3 tab, 12 ref.

Descriptors: *North Carolina, *Ocean circulation, Circulation, Surges, Model studies, Winds, Mathematical models, Hurricanes, Water resources development.
Identifiers: *Pamlico Sound(NC).

Pamlico Sound is a large semi-enclosed body of partially saline water on the coast of North Carolina separated by a narrow strip of barrier islands from the Atlantic Ocean. Freshwater inflow is from two major rivers and from Albemarle Sound. There is tidal flow across the inlets. Wind is a major factor in circulation, and there is considerable surge action during the hurricanes. A numerical model based on the two-dimensional shallow water hydrodynamic equations is used to compute water surface elevations and currents. The model uses an explicit finite difference representation, and includes convective acceleration, and nonlinear surface and bottom stress. The time dependent water movements are computed for an observed hurricane with good success. The model can be used to predict surge heights for coastal protection, and it will provide data for water resource management and for pollution control. (NOAA)

W77-07320

PHYSICAL ENVIRONMENT ATLAS OF COASTAL ALABAMA,
Alabama Univ. System, Dauphine Island. Marine Science Programs; and Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss.
W. W. Schroeder.
Mississippi-Alabama Sea Grant Consortium Report No. MASGP-76-034, (1976). 239 p. Also as: MESC Contribution No 104. SG-04-5-158-54, 04-6-158-44060; and NASA NAS-5-21876, NAS-8-30810.

Descriptors: *Alabama, *Data collections, Physical properties, *Baseline studies, Coasts, Temperature, Salinity, Hydrography, *Maps.
Identifiers: Oceanographic data.

The purpose of this atlas is to document the physical environment of coastal Alabama. Data are presented as facts without any interpretation. Geographic units are treated individually and environmental conditions described are for the period of 1973 to 1976. (NOAA)
W77-07322

WIND AND CURRENT PATTERNS IN AN ARCTIC COAST LAGOON,
Alaska Univ., College. Inst. of Marine Science.
J. A. Dygas, and D. C. Burrell.
Reprinted from: Ocean Engineering, Vol 3, p 317-327, 1976. 9 fig, 14 ref. Also as: Alaska Univ. Inst. Marine Science Contribution No. 281. SG-04-6-158-44039 EPA-R-801124.

Descriptors: *Winds, *Currents(Water), *Arctic Ocean, *Lagoons, *Alaska.
Identifiers: Beaufort Sea(Simpson Lagoon Alas).

The response of wind-drift currents to the prevailing summer wind regime is reported for Simpson Lagoon on the Beaufort Sea (Arctic Ocean) coast of Alaska. Wind and current measurements were taken over the period July 17 to October 20 and August 11 to September 18, 1972, respectively, at a site eastward of the Colville River delta. Mean wind speeds and the frequency of occurrence of westerly storms tend to increase from July to October. Prevailing currents within the lagoon are towards the W to NW driven by the prevailing northeasterly winds. Relatively rapid reversals of current direction occur in response to alternating easterly and westerly winds. Cross correlations of power spectral of the filtered E-W components of the lagoon current record with the concurrent wind data gave a periodicity of 4-5 days at a 70% level of coherence. A linear correlation of -0.83 was obtained between the E-W components of the filtered current record and the wind record, and net water transport (from a progressive current vector analysis) over this period was determined to be towards the WNW with a mean vector velocity of 10.6 cm/sec. (NOAA)
W77-07323

WASSAW ISLAND EROSION STUDY. PART 1: SEDIMENTARY FRAMEWORK OF A CHANNEL MARGIN SHOAL OF AN EBB DELTA, WASSAW SOUND, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.; and Georgia Marine Science Center, Savannah.
G. F. Oertel.
Sea Grant Technical Report Series No. 77-1, January 1976. 19 p, 9 fig, 7 ref. SG-10-32-RR-273-077.

Descriptors: *Georgia, *Sedimentation, *Spatial distribution, *Sediment distribution, Shoals, Deltas, Coasts, Beach erosion.
Identifiers: Bioturbation, Wassaw Island(Geo).

A detailed description of the sediment carpet on the shoal is given based on the analysis of 36 box cores taken from a 2 x 4 mile grid. The coring device took relatively undisturbed samples that could be analyzed for primary and biogenic sedimentary structures, grain size and textures. The fine and very-fine grained sands on the marginal shoal have low threshold velocities. These well sorted, fine sediments are very susceptible to rapid transit with increases in physical energy. The general lack of secondary mixing in shoal sediments suggests that these sediments undergo continuous reporking and apparently the shoal is in dynamic equilibrium with physical forces. The coarse sediment on the channel margin is a 'lag' deposit and is also in dynamic equilibrium with reversing inlet tidal currents. The offshore area and the area 'shielded' by the shoal have relatively stable sediment carpets and were less susceptible to ambient energy conditions. These relatively stable substrates were periodically reworked by large storm waves. (NOAA)
W77-07324

LONG ISLAND BEACH POLLUTION: JUNE 1976,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W77-07325

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Center for Marine and Coastal Studies.
E. D. Seneca, W. W. Woodhouse, Jr., and S. W. Broome.
Sea Grant Publication No. UNC-SG-77-03, Feb 1977. Reprint of U.S. Army Coastal Engineering Research Center Miscellaneous Rept. No. 76-3, Feb 1976. 42 p, 16 fig, 13 tab, 8 ref. Also as NCSU Rept. 77-1. SG-2-35178, 04-3-158-40. CERC-DACW72-73-C-0025.

Descriptors: *Dunes, *Shore protection, Water resources, *Stabilization, *North Carolina, Grasses, Vegetation, Sedimentation, Bank stabilization, Coasts.
Identifiers: *Panicum amarum, American beachgrass, Sea oats, *Dune stabilization, *Bitter panicum.

Information is presented to assist coastal engineers in dune stabilization by the establishement and development of vegetation. Sand accumulation and profile data suggest that bitter panicum should not be used in monospecific plantings to build dunes along the North Carolina coast. The results indicate that the mixed species planting is almost as good at dune building as monospecific stands of American beachgrass. These mixed species plantings are ecologically more desirable because of the insect, disease, and physiological problems associated with American beachgrass at this latitude. In a mixed species planting of American beachgrass, bitter panicum, and sea oats, a dune can be built primarily by the sand trapping potentials of American beachgrass and sea oats; when American beachgrass begins dying out, it can rapidly be replaced by the other two native grasses to stabilize the area. The principal values of bitter panicum are in stabilizing sand coastal areas and in mixed species plantings to build and stabilize coastal dunes in the southeastern United States. (NOAA)
W77-07327

HYDROGRAPHIC PROPERTIES, MESA NEW YORK BIGHT ATLAS MONOGRAPH 1,
New York Sea Grant Inst., Albany,
M. J. Bowman, and L. D. Wunderlich.
Report NYSSGP-AM-77-002, February 1977. 78 p, 14 fig, 2 tab, 105 ref, 13 maps. SG-2-35281 and ONR-00014-68-C-0298.

Descriptors: Hydrography, *Continental shelf, Water properties, Seasonal, *Salinity, *Temperature, New York, *Hydrologic properties, *Density, Environment, Maps.
Identifiers: Environmental conditions, *Seasonal variations, *New York Bight, *Middle Atlantic Bight, Oceanographic data.

Cycles of temperature, salinity, and density characteristic of the Middle Atlantic Bight, which includes New York Bight, are determined by seasonal patterns of insolation, river runoff, evaporation minus precipitation, winds, ocean currents, and shelf/slope exchange processes. Shelf temperatures have a large annual nearshore range around 25 degree C; the water column is unstratified in winter but is dominated by a strong thermocline in summer. A cool pool of bottom shelf water on the middle and outer continental shelf remains during the summer as a remnant of the previous winter and persists throughout the entire Middle Atlantic Bight. (NOAA)
W77-07328

THE EFFECT OF COLLECTOR DISCHARGE WATER FROM RICE FIELDS ON THE ZOOPLANKTON OF SOME KUBAN ESTUARIES, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5C.
W77-07331

A STUDY ON STANDING CROPS IN PHRAGMITES COMMUNIS COMMUNITIES AND THEIR ENVIRONMENTAL FACTORS, (IN KOREAN),
Mokpo Teachers' Coll. (South Korea).
For primary bibliographic entry see Field 5C.
W77-07335

PROCEEDINGS OF THE SEVENTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
For primary bibliographic entry see Field 8D.
W77-07342

SALVOPS-HOPPER DREDGE 'A. MACKENZIE',
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 8D.
W77-07343

THE PORT OF NEW ORLEANS AND ITS DREDGING PROGRAM,
Williams-McWilliams Co., Inc., New Orleans, La.
For primary bibliographic entry see Field 8D.
W77-07348

THE RESPONSES OF SOME ESTUARINE ORGANISMS TO SUSPENDED SOLIDS,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
For primary bibliographic entry see Field 8D.
W77-07353

THE ANALYSIS OF AMMONIA IN POLLUTED SEA WATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 5A.
W77-07362

EFFECT OF THE ASWAN HIGH DAM ON THE NILE FLOOD AND ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
S. H. Sharaf El Din.

Limnology and Oceanography, Vol 22, No 2, p 194-207, March 1977. 17 fig, 24 ref.

Descriptors: *Dams, *Floods, *Estuaries, *Circulation, Estuarine environment, Hydrography, Biological communities, Nutrients, Flood flow, Foreign research, Foreign countries, *Sediment transport.
Identifiers: *Aswan High Dam, *Nile River, *Egyptian coast, *Mediterranean Sea, *Levantine Sea, Biological economy, Nutrient budget, Flood season.

From 60-180 million tons of sediments and 18 x 10 to the 9th power to 55 x 10 to the 9th power cu m of water were transported to the Mediterranean Sea by the Nile annually before the Aswan High Dam was erected in 1964. Before completion of the dam, during the flood period the estuarine circulation pattern was a two-layer flow at the mouth of the two estuaries. In winter, the circulation pattern was a one-layer flow of seawater; this pattern had persisted during most of the year since 1964. The velocity of the currents at the mouth of the Nile branches reached more than 4 knots at the surface but was less than 0.5 knot at the bottom during the flood period before 1964. After 1964, the velocity dropped considerably. General oceanographic conditions in the offshore region beyond the continental shelf did not change noticeably, but hydrographic conditions over the continental shelf in front of the delta showed considerable change after 1964. Also, since 1964 almost no sediment has been discharged from the Nile. As a result, an imbalance in the near-coast sediment budget was produced which increased erosion at the two mouths of the river and caused a shift of the sediments along the coast. (Roberts-ISWS)
W77-07363

FURTHER TRANSITION STATES OF THE BAJA CALIFORNIA UPWELLING ECOSYSTEM,
Brookhaven National Lab., Upton, N.Y. Oceanographic Sciences Div.
For primary bibliographic entry see Field 5C.
W77-07365

THE RESPONSE OF AN ESTUARY TO THE CLOSURE OF A MOBILE BARRIER; RICHMOND BARRIER ON THE UPPER THAMES ESTUARY,
Institute of Oceanographic Sciences, Birkenhead (England).
A. J. Bowen, and S. J. Pinless.
Estuarine and Coastal Marine Science, Vol 5, No 2, p 197-208, March 1977. 7 fig, 1 tab, 5 ref.

Descriptors: *Estuaries, *Barriers, *Mathematical models, Foreign research, Foreign countries, Tides, Tidal effects, Hydraulic models, Numerical analysis, Estuarine environment, Model studies.
Identifiers: *Mobile barrier, Richmond barrier, *Thames Estuary, Woolwich barrier, Tidal regime, Tidal gages, Estuarine motion.

A detailed, one-dimensional, numerical model of the Thames Estuary above Chelsea was developed to examine the dynamics of this complex region, a region which has been represented crudely in previous models of the whole estuary. The model was found to describe accurately the tidal regime in this area, correctly reproducing the effect of a mobile barrier closing across the tide. Opportunities for verification of predicted changes due to major alteration in the geometry of the system were rare, usually being possible only in a follow-up study after a new structure has been completed. The half-tide barrier at Richmond was used to check predictions against direct observations. The Thames Flood Prevention Investigation, commissioned by the Greater London Council, supported the project which was to evaluate changes in the tidal regime and extreme levels in the River Thames resulting from the closure of the Woolwich Barrier. (Roberts-ISWS)
W77-07366

THE STABILITY DURING MANY YEARS OF THE MID-TIDAL SHORE AT PENRHYN BAY, NORTH WALES, AND A NOTE ON THE PEAT BEDS AT RHOS-ON-SEA,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
D. P. Wilson.
Estuarine and Coastal Marine Science, Vol 5, No 2, p 209-213, March 1977. 3 plate, 10 ref.

Descriptors: *Peat, *Stability, *Tides, Shores, Shoreline cover, Topography, Storms, Boulders, Erosion, Photography, Rocks, Bays.
Identifiers: *Penrhyn Bay, *North Wales, *Rhos-on-Sea, Mid-tidal shore, Photographs, Mid-tidal area, Cliffs.

It was shown that the shore level at Penrhyn Bay, North Wales, seaward of the shingle slope at the foot of the promenade wall had not changed appreciably for over 50 years. Previously published material contradicted this statement, but the statement is substantiated not only by reference to old photographs, but also by personal knowledge of the author. The shore and its major structures, natural and man-made, have remained virtually unchanged since almost 60 years ago. Storms have little effect on the almost level boulder-strewn, mid-tidal area. Except for human interference, there is no reason to anticipate any major change in the topography for many years in the future. Similarly, peat beds at Rhos-on-Sea, reported to have long since been lost by erosion, still exist. (Roberts-ISWS)
W77-07367

PHOSPHORUS AND CARBON DISTRIBUTIONS IN A POLLUTED COASTAL ENVIRONMENT,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W77-07368

PREDICTING CHANGES IN TIDAL REGIME: THE OPEN BOUNDARY PROBLEM,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 8B.
W77-07370

INTERACTION OF TEMPERATURE AND SALINITY ON OXYGEN CONSUMPTION OF THE ESTUARINE CRAB PANOPEUS HERBSTII,
Wake Forest Univ., Winston-Salem, N. C. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07375

DAY DEGREE GROWTH MODELS FOR INTERTIDAL OYSTERS,
South Carolina Univ., Georgetown. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
R. F. Dame.
Contribution in Marine Science, Vol 19, 1975, p 107-112, 2 fig, 2 tab, 17 ref.

Descriptors: *Mathematical models, *Forecasting, *Growth rates, *Oysters, Intertidaal areas.
Identifiers: Day degree growth models.

Data are presented which show linear and polynomial day degree models to be capable of predicting oyster growth in terms of height or weight. Linear day degree models utilizing whole weight observations explain at least 94% of the variability in the seasonal growth of intertidal oysters, but fail to accurately describe all the fluctuation in growth rate. Growth data from observation utilizing shell height measurements did not fit either the linear not the quadratic day degree models as well as the whole weight observations. Quadratic day degree models offered an increase in the accuracy of prediction for the observed data, but gave completely erroneous predictions of growth if extended to future years without new data. The coefficients of the quadratic or polynomial models have not as yet been shown to have any biological meaning. (Chilton-ORNL)
W77-07376

SUMMER GROWTH DEPRESSION IN THE STRIPED MULLET, MUGIL CEPHALUS L.,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5C.
W77-07378

BACTERIOLOGY OF CHESAPEAKE BAY SURFACE WATERS,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-07382

INFLUENCE OF LIGHT AND TEMPERATURE ON THE PHOTOSYNTHETIC RATE OF MARINE BENTHIC DIATOMS,
Groningen Rijksuniversiteit (Netherlands). Dept. of Systematic Botany.
For primary bibliographic entry see Field 5C.
W77-07385

LIFE HISTORY PATTERNS IN THE COASTAL SHINER, NOTROPIS PETERSONI, FOWLER,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07386

ASPECTS OF THE LIFE HISTORY OF TRESUS NUTTALLII IN ELKHORN SLOUGH,
Moss Landing Marine Lab., Calif.
P. Clark, J. Nybakken, and L. Laurent.
California Fish and Game, Vol. 61, No. 4, 1975. p 215-227, 9 fig, 9 ref.

Descriptors: *Life history studies, Period of growth, *Growth rates, *Clams, Reproduction, *California.
Identifiers: Caper clams, Tresus nuttallii, *Elkhorn slough(Calif).

Gonadal sections examined for the period of February 1970-June 1972 suggested that the primary spawning period of the gaper clams was from February through April although some spawning probably occurs throughout the year. Growth curves were established which can be used to estimate clam length at a given age. (Chilton-ORNL)
W77-07388

QUALITATIVE AND QUANTITATIVE STUDIES ON THE MEIOFAUNA OF A TROPICAL FRESH WATER STREAM SUBJECT TO TIDAL INFLUENCE, (IN ITALIAN),
Andhra Univ., Waltair (India). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-07390

AQUATIC ORGANISM CONTAMINATION BY MERCURY RESIDUES IN THE COATZACOALCOS RIVER ESTUARY, MEXICO,
Universidad Nacional Autonøma de Mexico, Mexico City. Instituto Nacional de Energia Nuclear.
For primary bibliographic entry see Field 5C.
W77-07394

ACCUMULATION AND DISTRIBUTION OF TRACE METALS AND RADIONUCLIDES IN MARINE ORGANISMS (PARTICULARLY

TAPES DECUSSATUS L.) IN THE IZMIR BAY AREA, TURKEY,
Aegean Univ., Bornova (Turkey). Marine Biological Lab.; and Aegean Univ., Bornova (Turkey). Dept. of General Zoology.
For primary bibliographic entry see Field 5C.
W77-07395

DEVELOPMENT OF EGGS AND EMBRYOS OF THE SURF CLAM, SPISULA SOLIDISSIMA, IN SYNTHETIC SEAWATER,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center; and National Marine Fisheries Service, Milford, Conn. Milford Lab.
For primary bibliographic entry see Field 5C.
W77-07396

COMPARATIVE ECOPHYSIOLOGY OF GAMMARIDS (CRUSTACEA: AMPHIPODA) FROM MARINE, BRACKISH AND FRESH-WATER HABITATS, EXPOSED TO THE INFLUENCE OF SALINITY-TEMPERATURE COMBINATIONS. I. EFFECT ON SURVIVAL,
Amsterdam Univ., Netherlands, Dept. of Experimental Biology.
For primary bibliographic entry see Field 5C.
W77-07397

EFFECT OF NUTRIENT ENRICHMENT ON THE HETEROTROPHIC UPTAKE OF ORGANIC SOLUTES BY MICROORGANISMS,
For primary bibliographic entry see Field 5C.
W77-07466

AN INVESTIGATION OF COLLOIDAL ORGANIC PARTICLES ISOLATED FROM DIFFERENT POPULATIONS OF BIVALVES,
For primary bibliographic entry see Field 5A.
W77-07498

ASPECTS OF ZOOBENTHOS ECOLOGY OF THE MACKENZIE DELTA, N.W.T.,
For primary bibliographic entry see Field 5C.
W77-07499

UPTAKE AND RETENTION OF KUWAIT CRUDE OIL AND ITS EFFECTS ON OXYGEN UPTAKE BY THE SOFT-SHELL CLAM, MYA ARENARIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W77-07506

BACTERIOLOGICAL STUDIES IN THE CIENAGA GRANDE (GREAT MARSH) OF SANTA MARIA, COLUMBIA, (IN SPANISH),
For primary bibliographic entry see Field 5C.
W77-07512

THE LENTIC AND LOTIC FRESHWATER TYPES OF MARION ISLAND (SUB-ANTARCTIC): A LIMNOLOGICAL STUDY,
For primary bibliographic entry see Field 5C.
W77-07514

INSTABILITY IN TIDAL FLOW COMPUTATIONAL SCHEMES,
Hydraulics Research Station, Wallingford (England).
T. J. Weare.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. HY5, Proceedings paper No. 12100, p 569-580, May 1976. 6 fig, 3 ref.

Descriptors: *Hydraulics, *Tidal waters, *Numerical analysis, *Mathematical models, Tides, *Stability, Equations, Systems analysis.
Identifiers: *Finite difference theory, Tidal currents.

A careful analysis of the multioperational finite difference schemes proposed by Leendertse reveals a nonlinear numerical instability. This instability arises from the imperfect time centering of certain nonlinear terms in the shallow water equations. For many applications, the natural damping due to the friction term controls or masks the instability. The results of the stability analysis suggest that the instability becomes uncontrollable when a small grid spacing is used. These conclusions are confirmed by numerical experiment. (Bell-Cornell)
W77-07548

SUBJECT KEYWORD LIST, (ESTUARINE AND COASTAL MARINE SCIENCE),
Estuarine and Coastal Marine Science, Vol. 5, No. 2, p 1-34, March 1977.

Descriptors: *Information retrieval, *Estuaries, *Estuarine environment, *Indexing, Information exchange, Documentation, Publications, *Thesauri, Abstracts, Coasts, Classification.
Identifiers: *Glossaries, Subject keyword list.

A list was tabulated of 7800 subject keywords which will be used in the future to define the subject matter of papers published in Estuarine and Coastal Marine Science (ECMS), and to compile an annual index. The abstract of each paper will be preceeded by up to 8 Keywords chosen by the author to define the paper. These Keywords can then be used by librarians indexing papers; by readers searching for literature on a given subject; or in computerized information retrieval systems. The efficient allocation of Keywords to papers should increase the potential readership of all papers in the Journal. The ECMS list was compiled from the following sources; (1) Oceanic Abstracts, word list (1976); (2) FAO Aquatic Sciences and Fisheries draft list of permitted Keywords (1976); (3) Illiffe Science and Technology, Underwater Bulletin; (4) Subject heads from 'Encyclopaedia of Beaches and Coasts', edited by M. Schwartz; (5) Wordlist submitted by Estuarine and Brackish-Water Sciences Association; (6) US Army Beach Erosion Board, Glossary of Terms (1973); (7) Commercial Oceanology Study Group, word list (1965); and (8) Index from 'Estuaries', by K. R. Dyer. Every Keyword on the ECMS list has a 4-letter code preceeding it so that its source can be identified when matching other index systems. Where a Keyword occurs in several lists, the code indicates the largest list in which it occurs. The ECMS Keyword List is not a fully structured list, and it is not backed by a structured Thesaurus. The decision to publish and use the ECMS list in its present form was made because of the urgent need for a finite list of some kind. (Humphreys-ISWS)
W77-07564

STUDIES ON FUNGAL PROPAGULES IN THE WESER ESTUARY (GERMAN BIGHT): I. QUANTITATIVE DATA 1974, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W77-07583

DATA 1973/1974 REGARDING HYDROGRAPHY AND WATER QUALITY IN THE WESER ESTUARY, GERMANY, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W77-07584

STUDY OF BACTERIAL CONTAMINATION IN THE PORT MAHON HARBOR: EFFECT OF ECOLOGICAL CONDITIONS OF THE HARBOR, (IN SPANISH),
Instituto Espanol de Oceanografia, Palma de Mallorca (Spain). Coastal Lab.
For primary bibliographic entry see Field 5A.
W77-07588

BACTERIOLOGIC ANALYSIS IN THE AROSA, VIGO AND PONTEVEDRA ESTUARIES, (IN SPANISH),
For primary bibliographic entry see Field 5A.
W77-07589

SELF-PURIFICATION IN THE COASTAL WATERS OF THE BLACK SEA, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-07592

STUDY OF BACTERIA ASSOCIATED WITH THE REARING OF LARVAE OF MARINE BIVALVES, (IN FRENCH),
Universite de Bretagne-Occidentale, Brest (France). Laboratoire de Zoologie.
For primary bibliographic entry see Field 5C.
W77-07599

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PHENOL-SELECTIVE, HIGHLY RESISTANT RO-MEMBRANES MADE FROM PVA FOR THE PURIFICATION OF TOXIC INDUSTRIAL WASTES,
Erlangen-Nuremberg Univ. (West Germany). Institut fuer Technische Chemisches.
For primary bibliographic entry see Field 5D.
W77-07206

LARGE-SCALE REVERSE OSMOSIS PROCESSING OF METAL FINISHING RINSE WATERS,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
For primary bibliographic entry see Field 5D.
W77-07207

THE DESALTING AND RECYCLING OF WASTE WATERS FROM TEXTILE DYEING OPERATIONS USING REVERSE OSMOSIS,
Mansoura Univ. (Egypt). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5D.
W77-07220

BRACE RESEARCH INSTITUTE, ANNUAL REPORT, (1976),
Macdonald Coll. Montreal (Quebec). Brace Research Inst.
T. A. Lawand, and G. L. d'Ombrain.
Annual Report No. M32, August 1976. 53 p, 44 photo, 10 dwg.

Descriptors: *Research and development, *Energy, *Solar radiation, *Winds, Saline water, Desalination, Universities, Agriculture, Energy conservation, Energy budget, Irrigation water, Irrigation, Water quality, Irrigation engineering, Deserts, Arid climates, Arid lands, Tropical regions, Africa, Foreign countries, Canada, Geographical regions.
Identifiers: Solar energy.

The Brace Research Institute of McGill University concentrates its research on eliminating the salt content of sea water so that it may be used for irrigation, and on developing methods for making

desert or arid land available for agricultural purposes. The institute's annual report discusses its myriad research and development activities. For example, the principal thrust of the institute's overseas sector in the past year has been their role in the establishment of a Rural Energy Centre utilizing renewable energy resources in Senegal. The institute undertook a study on the possibility of meeting the village's basic energy requirements for cooking, some lighting, and water supply pumping through solar, wind, and biogas energies. Negotiations are pending with other underdeveloped countries for a program of similar activities. Due to its unique expertise in both solar and wind energy, and saline water conversion, the institute has played a major role as a consultant in the field of international technical collaboration. The institute disseminated a considerable number of do-it-yourself leaflets, plans and specifications of simple equipment for the conversion of natural energies to useful purposes. The institute also participated in the United Nations Habitat Conference, and demonstrated its new version of a solar steam cooker. (Moorhouse-Florida)
W77-07242

THE FEASIBILITY OF A WATER IMPORTATION PROJECT FOR SOUTH FLORIDA,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07259

3B. Water Yield Improvement

PARAMETERIZATION OF DEPOSITIONAL ICE GROWTH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2B.
W77-07171

PHYSICAL PROBLEMS OF WEATHER MODIFICATION,
Warsaw Univ. (Poland). Faculty of Geophysics.
K. E. Haman.
Hydrological Sciences Bulletin, Vol 21, No 4, p 587-602, December 1976. 19 ref, 1 append.

Descriptors: *Weather modification, *Cloud seeding, *Precipitation(Atmospheric), Cloud physics, Climatology, Evaluation, Artificial precipitation, Rain, Rainfall, Snow, Silver iodide, Storm structure, Storms, Clouds, Weather, Meteorology, Reviews.

There are many contrasting views on the success of experiments with weather modification. This paper reviewed a large number of studies, commencing with a summary of some of the pertinent problems in cloud physics and those leading to cloud modification. The report dealt with the techniques of modification such as the use of dry ice and silver iodide and gave details of the results of experiments with clouds of different types. The conclusion reached was that the result of methods of modification used at present are not sufficiently predictable to warrant their use commercially and that the results of most of the interesting studies have not been evaluated by sufficiently reliable methods. (Sims-ISWS)
W77-07357

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 1, TEXT OF REPORT,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
January 1977, 251 p. Edited by Patrick Squires. Bur Reclam 14-06-D-7000.

Descriptors: Atmospheric physics, Climates, Cloud physics, *Cloud seeding, Meteorology, *Weather modification, Silver iodide, *Nevada, California, *Precipitation(Atmospheric), Data collections, Instrumentation, Measurement, Networks.
Identifiers: Truckee River, *Pyramid Lake project.

A randomized cloud seeding project was carried out over an area of 1052 sq. mi. near Lake Tahoe for 3 winter-spring seasons. Six remotely controlled silver iodide generators were located on the upper western slopes of the Sierra Nevada, and precipitation was measured by means of 23 recording gauges and 54 non-recording gauges. A total of 132 experimental periods (corresponding to forecast synoptic scale storms) averaged some 35 hours in duration. The preliminary statistical analysis is based on a comparison of periods randomly assigned to be seeded, or not seeded, on a 50-50 basis. However, for a variety of reasons, seeding actually occurred for only about half the total hours assigned to be seeded. Thus, the effect of seeding can appear here only in a somewhat diluted form. The varying duration of experimental periods was taken into account by assuming a Gamma distribution of precipitation amounts, with the shape parameter a linear function of duration; the effect of seeding then appeared as a change in the scale parameter. By means of a forecast, storms were classified as heavy, moderate, light or marginal. The evidence for a positive seeding effect is not conclusive; however, the apparent effect or seeding all categories of storms was an increase of 16%. In the group comprising heavy and moderate storms, the apparent increase was 25%. If the true effect had been equal to this, the chance of detecting it, at the 5% significance level, would have been about 1 in 5. (See also W77-07567) (Bur Reclam)
W77-07566

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 2, APPENDICES,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
January 1977, 224 p. Edited by Patrick Squires. BuRec 14-06-D-7000.

Descriptors: Atmospheric physics, Climates, Cloud physics, *Cloud seeding, Meteorology, *Weather modification, *Silver iodide, *Nevada, California, Precipitation(Atmospheric), Data collections, Instrumentation, Measurement, Networks.
Identifiers: Truckee River, *Pyramid Lake project.

The fourteen appendices are entitled: Rare and Endangered Wildlife Species of the Lake Tahoe Region; Remote Controlled Mobile AgI Aerosol Generator; Observed or Actual Storm Periods, 1972-75; Typical Synoptic Examples of Sierra Nevada Storms; Total Seasonal Precipitation October 1 to May 31; Control Center Operations Summaries; Daily Record of Weather Modification Activities; Record Structure; Control Center Data; Non-Recording (True) Precipitation Measurements; Major Computer Programs Developed for Data Acquisition and Processing; Data Set 5; Precipitation Amounts for 11 Selected Stations; Data as Used in Analysis (d); and Sample Teletype Messages as Transmitted Between Desert Research Institute and Berkeley Statistical Laboratory. (See also W77-07566) (BuRec).
W77-07567

RECLAMATION RESEARCH IN THE SEVENTIES, SECOND PROGRESS REPORT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07600

3C. Use Of Water Of Impaired Quality

BRACE RESEARCH INSTITUTE, ANNUAL REPORT, (1976),
Macdonald Coll. Montreal (Quebec). Brace Research Inst.
For primary bibliographic entry see Field 3A.
W77-07242

CONSUMPTIVE USE OF GROUND WATER,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07257

PROTEIN PRODUCTION BY RUSSIAN THISTLE: EFFECTS OF WATER AND NITROGEN ON PROTEIN YIELDS,
New Mexico State Univ., University Park. Dept. of Chemistry.
For primary bibliographic entry see Field 3F.
W77-07281

EFFECT OF THE PRESENCE OF SODIUM CHLORIDE IN THE MEDIUM ON GROWTH, DEVELOPMENT AND DISTRIBUTION OF CHLORINE AND SODIUM IN SORGHUM DOCHNA F., (IN FRENCH),
Ecole National Superieure Agronomique de Toulouse (France). Laboratoire de Physiologie Vegetale Appliquee's.
M. Garcia, P. Morard, and J. Berducou.
Bull Soc Hist Nat Toulouse 111(1/2), p 153-159, 1975.

Descriptors: *Sodium chloride, *Sorghum, Chlorine, Sodium, Salt tolerance, Irrigation, Growth rates, Root zone, Mineralogy.
Identifiers: Sorghum-Dochna.

Because of decreasing freshwater supplies, it was considered important to examine effects of using water with higher salt levels in irrigation. The plants were grown in hothouse conditions and varying amounts of NaCl were supplied. A dose of 6 meq/l was beneficial to plant growth. Stronger doses retarded growth, however. Large amounts of sodium accumulated in the roots, while C concentrations were higher in aerial parts, espcially the leaves. Levels of these elements in various plants parts was always related to the amount of NaCl in the nutrient solution.--Copyright 1977, Biological Abstracts, Inc.
W77-07291

WATER QUALITY AND AQUITARD PERMEABILITY,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-07551

3E. Conservation In Industry

LARGE-SCALE REVERSE OSMOSIS PROCESSING OF METAL FINISHING RINSE WATERS,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
For primary bibliographic entry see Field 5D.
W77-07207

WASTE WATER RECLAMATION SYSTEM UPS PRODUCTIVITY, CUTS WATER USE,
Beckman Instruments, Inc., Porterville, Calif.
For primary bibliographic entry see Field 5D.
W77-07210

ULTRAFILTRATION OIL RECLAMATION PROCESS,
Chester Engineers, Inc., Coraopolis, Pa.
For primary bibliographic entry see Field 5D.
W77-07212

GREAT LAKES PAPER LAUNCHES FIRST CLOSED-CYCLE KRAFT PULP MILL.
For primary bibliographic entry see Field 5D.
W77-07218

A MINI-POLLUTION TANNERY,
Environmental Protection Agency, Kansas City, Mo. Region VII.
For primary bibliographic entry see Field 5D.
W77-07225

GEOTHERMAL POWER, THE 'SLEEPER' IN THE ENERGY RACE,
Magma-Thermal Power Project, Santa Rosa, Calif.
R. Lengquist, and F. Hirschfeld.
Mechanical Engineering, Vol. 98, No. 12, p 25-31, December, 1976.

Descriptors: *Geothermal studies, *Thermal powerplants, *Energy conversion, *Electric power production, Thermal water, Hot springs, Turbines, Generators, Electric power costs, Corrosion, Environmental effects, Hydrogen sulfide, California.
Identifiers: The Geysers Geothermal Power Plant, Pacific Gas and Electric Company, Sonoma County(California).

Although geologic understanding of geothermal energy is still in relative infancy, potential for the expanded use of this valuable resource is great, as is demonstrated by the Geysers Geothermal Power Plant in Sonoma County, California. Once a popular health resort, the Geysers area has undergone extensive development by private enterprise. The present electric plant has an installed capacity of 522 MW, with projected expansion to 1000 MW by 1980. Individual generating units of up to 110 MW are now in operation, with even larger units in the planning stages. Use of natural steam and the consequent elimination of boilers are the key factors in making the Geysers plant such an economical and simple operation. Both capital costs and operating costs compare favorably with those of installations fueled by other means, and it is estimated that the Geysers has saved 25 million bbl of fuel oil since 1960. Some environmental problems, notably H2S gas and well noise, have been encountered and largely corrected. Corrosion effects of the H2S are avoided by substituting aluminum, stainless steel, cast iron, and epoxy-coated asbestos cement for copper in piping and condenser lines and hardware. (Eberle-NWWA)
W77-07296

ELECTRIC POWER GENERATION FROM GEOTHERMAL HOT WATER DEPOSITS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8C.
W77-07300

GEOTHERMAL ENERGY: NEEDED, EFFECTIVE HEAT TRANSFER EQUIPMENT,
International Society for Geothermal Engineering, Whittier, Calif.
For primary bibliographic entry see Field 8G.
W77-07301

GEOTHERMAL SYSTEMS AND POWER DEVELOPMENT,
Department of Scientific and Industrial Research, Auckland (New Zealand).
For primary bibliographic entry see Field 4B.
W77-07302

PHYSICAL MODELING OF COMBINED FORCED AND NATURAL CONVECTION IN WET GEOTHERMAL FORMATIONS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4B.
W77-07303

WASTEWATER AND SLUDGE CONTROL IN THE CANADIAN METAL FINISHING INDUSTRY, SEGMENT INCLUDING CHEMICAL, ELECTROLYTIC TREATMENT; ELECTROCHEMICAL MACHINING AND POLISHING; CYANIDE HARDENING,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W77-07333

REVIEW OF TREATMENT TECHNOLOGY IN THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA.
Stanley Associates Engineering Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5D.
W77-07341

ASSESSMENT OF GEOTHERMAL RESOURCES OF THE UNITED STATES--1975.
Geological Survey, El Paso, Tex.; and Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07476

GEOTHERMAL RESOURCES, A NEW LOOK,
For primary bibliographic entry see Field 4B.
W77-07477

PROCEEDINGS, WATER POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY, (1975),
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W77-07562

3F. Conservation In Agriculture

PROTEIN PRODUCTION BY RUSSIAN THISTLE: EFFECTS OF WATER AND NITROGEN ON PROTEIN YIELDS,
New Mexico State Univ., University Park. Dept. of Chemistry.
J. H. Hageman, and J. L. Fowler.
Available from the National Technical Information Service, Springfield, VA, 22161 as PB-266 709, Price codes: A02 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Couces. Report No. 085, March 1977. 17 p, 14 tab, 9 ref. OWRT A-049-NMEX(2). 14-34-0001-6032.

Descriptors: *Forages, *Weeds, Plant growth, *Proteins, *Water requirements, Irrigation effects, Nutrient requirements, *Drought resistance, Productivity, Vegetation establishment, Nitrogen, Salt tolerance, *Nitrates, Crop production, New Mexico.
Identifiers: *Russian thistle, Salsola, Protein content, Water use efficiency.

The purpose was to determine whether Russian thistle (Salsola spp.) might have potential as either a protein source or a forage under conditions of restricted water. Salsola was chosen because it was reported to be a C4 plant which is efficient in water use, drought resistant, salt tolerant and because it had been used as a feed previously. In two seasons of field cultivation the following results were obtaind: (1) average percentage protein contents are 16% (range: 23-8.5%); (2) the protein is very well balanced with regard to amino acid content; (3) at water and nitrogen levels which provide maximal yields the nitrate content does not exceed 0.6% of dry weight; (4) the average percentage of crude fiber content (acid detergent fiber-acid detergent lignin) is 23% (range: 27%-16%); (5) average yield of above-ground dry matter for 1975, overall water and nitrogen treatments, was 7781 kg/ha; (6) the same yield figure for 1976 was 8645 kg/ha; (7) under optimal treatments yields greater than 10,000 kg/ha were obtained; and (8) with 35 cm total applied water and 112 kg/ha of nitrogen, conditions giving optimal yields, water use efficiency was 329 g water/g above-ground dry matter. These results compare favorably with alfalfa, which is the most widely grown forage in New Mexico. (Stockton- NMex State)
W77-07281

THE CHIEF DRILLER'S REPORT ON JCCIP,
Christian Organization for Relief and Rehabilitation, New York.
For primary bibliographic entry see Field 8C.
W77-07288

REDUCING POWER CONSUMPTION IN IRRIGATION SYSTEMS WITH THE AID OF A MATHEMATICAL MODEL FOR PIPE DIMENSIONING,
Academia de Studii Economice, Bucharest (Rumania). Dept. of Economic Cybernetics.
U. Berar, V. Ionescu, and R. Marinescu.
In: Economic Computation and Economic Cybernetic Studies and Research, No. 4, p 55-68, 1974. (Published in Rumania) 6 fig, 5 ref.

Descriptors: *Irrigation systems, *Pipes, *Optimization, Water supply, Pumping, Electric power, Flow, Pressure, Costs, Hydraulics, Dimensions, Computer models, Computer programs, Investment, Simulation analysis, Equations, Systems analysis.
Identifiers: Cost minimization, Sizing, Power minimization, Power consumption, Pipe diameter, Economic effects.

Presented is a mathematical model for the sizing of irrigation pipes (called antennae) by considering the simulation of the functioning conditions specific to these pipes. Calculated is the dimensioning of the antennae under real topographic conditions and under the conditions of flow and pressure characteristic of each case taken separately in the irrigation system. Derived is a solution for minimizing power and materials costs. The objective function is represented by the minimization of investments in the pipe and of costs of power to dissipate at some hydrants by eliminating to the maximum the use of pressure and/or flow limiters. The model allows the choice of diameters and materials after interchangeable catalogues. The calculus hypotheses taken into consideration are the same as in the case of the classical calculus, but laboratory research is also necessary for determining some possible minor phenomena yet unknown. (Bell Cornell)
W77-07547

WATER MOVEMENT IN SOIL FROM TRICKLE SOURCE,
Utah State Univ., Logan. Dept. of Agriculture and Irrigation Engineering.
For primary bibliographic entry see Field 2G.
W77-07550

SATURATED AND UNSATURATED FLOW TO PARALLEL DRAINS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W77-07552

SOLUTIONS TO GREEN-AMPT INFILTRATION EQUATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07553

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

BIBLIOGRAPHY AND INDEX OF NORTH DAKOTA WATER RESOURCES 1878-1970,
North Dakota Univ., Grand Forks.
For primary bibliographic entry see Field 10C.
W77-07140

WATER FLUX IN SOIL AND SUBSOIL ON A STEEP FORESTED SLOPE,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W77-07147

MISSOURI RIVER POWER CURVE REGRESSION EQUATIONS,
Missouri Univ., St. Louis. Dept. of Geology.
For primary bibliographic entry see Field 2E.
W77-07152

A RECONSIDERATION AND A GENERALIZATION OF LAWRANCE AND FIERING TWO-STATION MODELS,
Technical Univ. of Lisbon (Portugal). Dept. of Civil Engineering; and Lisbon Univ. (Portugal). Centre of Urban and Regional Systems.
For primary bibliographic entry see Field 2E.
W77-07157

FREE FLOW IMMEDIATELY BELOW SLUICE GATES,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-07161

HYDRAULIC JUMPS AND WAVES AT ABRUPT DROPS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-07163

FAR FIELD CIRCULATION VELOCITIES IN SHALLOW LAKES,
North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W77-07164

INSTREAM FLOW REGIMENS FOR FISH, WILDLIFE, RECREATION AND RELATED ENVIRONMENTAL RESOURCES,
Fish and Wildlife Service, Billings, Mont.
For primary bibliographic entry see Field 5C.
W77-07192

EVOLUTION AND OBJECTIVES OF RIVER BASIN COMMISSIONS IN THE UNITED STATES,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
For primary bibliographic entry see Field 6E.
W77-07249

SOME SUGGESTIONS FOR THE MANAGEMENT OF INTERNATIONAL RIVER BASINS,
New Mexico Univ., Albuquerque. School of Law.
For primary bibliographic entry see Field 6E.
W77-07250

FLORIDA STATUTES, CHAPTER 253--THE 1969 AMENDMENTS AND PROPOSED LEGISLATION,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07258

THE FEASIBILITY OF A WATER IMPORTATION PROJECT FOR SOUTH FLORIDA,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07259

PECOS RIVER COMPACT.
For primary bibliographic entry see Field 6E.
W77-07262

ARTESIAN WELLS AND STORAGE RESERVOIRS, AND WORKS CONNECTED THEREWITH.
For primary bibliographic entry see Field 6E.
W77-07263

APPROPRIATION OF WATER--PERMITS, CERTIFICATES AND LICENSES--SURVEY.
For primary bibliographic entry see Field 6E.
W77-07265

HYDROGEOLOGICAL APPLICATIONS OF EARTH RESOURCES TECHNOLOGY SATELLITE LANDSAT 1 IMAGERY,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7B.
W77-07339

MAINTENANCE DREDGING IN THE NEW ORLEANS DISTRICT, US ARMY CORPS OF ENGINEERS,
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8D.
W77-07347

UTILIZATION OF THE RESULTS FROM REPRESENTATIVE AND EXPERIMENTAL BASINS WITH A VIEW TO THE MANAGEMENT OF WATER RESOURCES,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
J. A. Rodier.
Hydrological Sciences Bulletin, Vol 21, No 4, p 531-544, December 1967. 6 fig, 6 ref.

Descriptors: *Rainfall, *Runoff, *Watersheds(Basins), *Africa, Spatial distribution, Temporal distribution, Distribution patterns, Model studies, Mathematical models, Land use, Streams, Rivers, Precipitation(Atmospheric), Rainfall-runoff relationships, Permeability, Hydrologic cycle, Hydrology.
Identifiers: *Sahel(Africa), *Congo(Africa).

The management of water resources requires knowledge of the spatial and temporal distribution of surface and groundwater resources and an assessment of the influence of man on the hydrological regime. For small water courses, regional estimates can be made from representative basins which offer guidelines (1) for the computation of mean annual flow and in some cases for the determination of the statistical distribution of the annual flows; and (2) for the computation of the 10-yr flood maximum discharge and volume. An example concerning the tropical African Sahel was given. From a general study of the daily precipitation, a simple rainfall/runoff model used on a daily basis and calibrated on data from representative basins, and the direct comparison of results from 55 representative basins, statistical distribution curves were established for annual runoff based on mean annual precipitation and the geomorphological characteristics of the basins. Another example concerning tropical Africa west of Congo presented a methodology for the computation of the 10-yr flood (maximum discharge and volume). The systematic study of 60 representative basins makes it possible to plot the runoff coefficient R/P as a function of basin climate, mean slope, and soil permeability. Other curves are used to determine the time of rise and the base time of the hydrograph as a function of the basin area and the mean slope. The experimental basin is a good tool for the assessment of the influence of man on hydrological parameters. An example showed the influence of land use on the regression between annual precipitation and annual runoff. (Sims-ISWS)
W77-07355

SIMULATION OF A SERIES OF DAILY AREAL MEAN RAINFALLS FOR A BASIN USING RAINFALL OBSERVATIONS AT A REFERENCE STATION LOCATED OUTSIDE THE BASIN,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
For primary bibliographic entry see Field 2B.
W77-07356

REGIONAL STUDY OF THE UPPER BASIN OF THE AAR FROM ITS SOURCES TO BERN: PROFILE OF FLOODS OF A GIVEN RETURN PERIOD AT ANY POINT ON THE RIVER (ETUDE REGIONALE DU BASSIN SUPERIEUR DE L'AAR DE SES SOURCES JUSQU'A BERNE: PROFILE DES CRUES DE PERIODE DONNEE LE LONG DU COURS D'EAU).
Ecole Polytechnique Federale de Lausanne (Switzerland).
For primary bibliographic entry see Field 2E.
W77-07358

PREDICTABILITY OF EFFECTS OF A SEVERE LOCAL STORM IN PENNSYLVANIA,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2B.
W77-07369

A BIBLIOGRAPHY OF SOVIET LITERATURE ON FRESHWATER HYDROBIOLOGY AND RELATED PROBLEMS FOR 1975: PART 21, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-07402

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 2, REGRESSION OF MEAN ANNUAL FLOWS ON PHYSIOGRAPHIC PARAMETERS,
Department of the Environment, Vancouver (British Columbia). Inland Water Directorate (Pacific Region); and Department of the Environment, Vancouver (British Columbia). Water Resource Branch.
For primary bibliographic entry see Field 2E.
W77-07434

LAKE RESTORATION THROUGH MECHANICAL HARVESTING OF AQUATIC VEGETATION,
For primary bibliographic entry see Field 5G.
W77-07451

EFFECTS OF THE CATASTROPHIC FLOOD OF DECEMBER 1966, NORTH RIM AREA, EASTERN GRAND CANYON, ARIZONA,
Geological Survey, Cheyenne, Wyo. Water Resources Div.; Geological Survey, Tucson, Ariz.; and Prescott Coll., Ariz.
For primary bibliographic entry see Field 2E.
W77-07480

APPARENT REGIONAL SKEW,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-07484

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07491

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07492

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70--PART 15. ALASKA.
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07493

TECHNIQUES FOR ESTIMATING FLOW CHARACTERISTICS OF WYOMING STREAMS,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
H. W. Lowham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 224/As, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 76-112, November 1976. 83 p, 31 fig, 4 tab, 27 ref.

Descriptors: *Flood forecasting, *Flow characteristics, *Peak discharge, *Channel morphology, *Wyoming, Analytical techniques, River basins, Streamflow, Flow rates, Flood data, Historic floods, Regression analysis.

This report presents relations for estimating peak flows and mean annual flow characteristics are: (1) The Channel-geometry method, whereby flow characteristics are related to channel dimensions; and (2) the basin-characteristics method, whereby flow characteristics are related to physiographic and climatic features of the drainage basin. Development of the channel-geometry method showed channel width to be the most significant channel dimension for estimating flow characteristics. Use of this method requires a field measurement of channel width. Development of the basin-characteristics method showed drainage-area size to be the most significant basin feature for estimating streamflow. In the mountainous areas, basin elevation also affect streamflow. Because these basin features can be determined from maps, this method does not require a visit to the site. (Woodard-USGS)
W77-07495

EVALUATION OF FLOOD FORECASTING-RESPONSE SYSTEMS,
Princeton Univ., N.J. Dept. of Civil Engineering.
M. Sniedovich, and D. R. Davis.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings Paper No. 12937, p 83-97, May 1977. 1 fig, 5 tab, 19 ref.

Descriptors: *Flood forecasting, *Flood damage, *Warning systems, *Systems analysis, *Evaluation, Decision making, Efficiency, Responses, Rivers, Probability, Optimization, Forecasting, Measurement, Equations, Mathematical models.
Identifiers: *Decision theory, Probability theory.

When the objective of operating a flood forecasting-response system is to reduce damage caused by flooding, rather than to provide 'accurate and timely' flood forecasts, improvements and changes to the system must be evaluated considering all components of the system and their interactions. For this purpose, a methodology is presented which considers the following components of the system: (1) the hydrometric system; (2) the forecasting model; (3) the dissemination system; and (4) the decision model used by the floodplain dweller and his protective system. Quantification is accomplished by a mathematical model that enables flood forecasing systems to be evaluated on the basis of expected reduction in damage due to the use of the system. Uncertainties in the forecast are handled in a decision theoretic manner that enables the calculation of an optimal response to a forecast. Comparison of optimal and nonoptimal responses illustrates the importance of considering the response when examining the effectiveness of flood forecasts. (Bell-Cornell)
W77-07524

PUMPED STORAGE OPTIMIZATION IN GENERATION SYSTEMS,
Natal Univ., Durban(South Africa). Dept. of Civil Engineering.
J. S. Windsor.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12946, p 99-109, May 1977. 4 fig, 8 ref.

Descriptors: *Pumped storage, *Powerplants, *Optimization, *Electric power production, Economic efficiency, Computer programs, Water resources, Equations, Mathematical models, Operations research, Planning.
Identifiers: Cost minimization, Systems engineering, Economic analysis, *Mixed integer programming.

Presented is a methodology which has particular reference to the integration of pumped-storage schemes into expanding electric-power systems. The model is based on an interpretation of the transshipment problem, and employs mixed integer programming to determine the minimum cost strategy for future investments and operating costs. The advantage of this approach is that it explicitly recognizes the system as consisting of a set of interacting subsystems which are coupled in space and time and which are operated under a single management unit. It also accounts for the economies of scale associated with the cost of building and operating the electric power facilities.(Bell-Cornell)
W77-07525

PUBLIC PARTICIPATION IN WATER RESOURCE DEVELOPMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydr. lab.
For primary bibliographic entry see Field 6B.
W77-07526

GAINS FROM JOINT OPERATION OF MULTIPLE RESERVOIR SYSTEMS,
Johns Hopkins Univ., Baltimore, Mo. Dept. of Geography and Environmental Engineering.
R. M. Hirsch, J. L. Cohon, and C. S. ReVelle.
Water Resources Research, Vol. 13, No. 2, p 239-245, April 1977. 5 fig, 2 tab, 9 ref, 1 appen.

Descriptors: *Water resources, *Reservoir operation, *Safe yield, Water supply, Costs, Design, Simulation analysis, Methodology, Optimization, Flow, Stochastic processes, Operations research, Equations, Mathematical models.
Identifiers: *Synergism, *Joint operation, *Operating rule, Cost minimization, LaGrange multiplier, Sizing.

Synergistic gains are defined as the gains in benefits due to joint operation of a system of reservoirs in excess of the benefits from optmal individual operation. These gains are a result of both the deterministic (regional) and the stochastic diversity of flows into each of the reservoirs. They are captured by the use of flexible reservoir operating rules which base release decisions for a given reservoir on the state of the entire system, not just on the state of that reservoir. Discussed are safe yield of independently operated reservoirs and of a system of jointly operated reservoirs, using simulation. One possible operating rule is formulated and is demonstrated to be highly effective in capturing synergistic gains. A hypothetical design problem of sizing three water supply reservoirs in parallel at least cost is solved by three methods. The first method, using LaGrange multipliers, assumes that no synergistic gains are achievable. The second and third methods recognize the existence of such gains. The method recommended here incorporates the operating rule into the design process and makes use of the observation that the system yield is a function of system capacity. (Bell-Cornell)
W77-07533

THE ECONOMIC BASIS OF RESOURCE INFORMATION SYSTEMS: THE CASE OF STREAMFLOW DATA NETWORK DESIGN,
Geological Survey, Reston, Va. Geologic Div.
For primary bibliographic entry see Field 7A.
W77-07534

RELIABILITY-CONSTRAINED DYNAMIC PROGRAMING AND RANDOMIZED RELEASE RULES IN RESERVOIR MANAGEMENT,
Worcester Polytechnic Inst., Mass. Dept. Civil Engineering.
L. A. Rossman.
Water Resources Research, Vol. 13, No. 2, p 247-255, April 1977. 2 fig, 5 tab, 20 ref.

Descriptors: *Reservoir operation, *Reservoir releases, *Stochastic processes, *Dynamic programming, Management, Reliability, Constraints, Optimization, Benefits, Methodology, Water policy, Reservoir storage, Annual, Probability, Equations, Model studies, Systems analysis.
Identifiers: Benefit maximization, Lagrangian duality theory, Release rules, Branch and bound procedure, Chance-constrained dynamic programming, Duality gaps.

A stochastic dynamic programming model for determining reservoir release rules which maximize expected net benefits subject to reliability constraints on system performance is presented within the framework of Lagrangian duality theory. The approach characterizes optimal release rules under discounting of benefits as being nonstationary. It also indicates when there exists a randomized rule which dominates the optimal deterministic rule. The methodology for obtaining these rules uses dual optimization to provide bounds on the optimal solution and a branch and bound procedure to resolve any duality gap which may occur if the bounds are not equal. The model is applied to a group of hypothetical

problems for which nonoptimal policies had previously been found by using chance-constrained dynamic programming. The approach presented is applicable to problems with several reliability constraints which limit the expected number of occurrences of chance events over the life of the system. (Bell-Cornell)
W77-07535

RESERVOIR OPERATION UNDER CONFLICTING OBJECTIVES,
Politecnico di Milano (Italy). Instituto di Elettrotecnica ed Elettronica.
G. Fronza, A. Karlin, and S. Rinaldi.
Water Resources Research, Vol. 13, No. 2, p 296-302, April 1977. 5 fig, 4 tab, 27 ref.

Descriptors: *Reservoir operation, *Multiple-purpose reservoirs, *Optimization, *Decision making, Simulation analysis, Lakes, Algorithms, Monthly, Economics, Equations, Mathematical models, Systems analysis.
Identifiers: *Game theory, Conflicting objectives, Operating rules, Benefit maximization.

The problem of determining the optimal operation of a monthly regulated two-purpose reservoir is discussed. A basic assumption is made about the decision-making structure of the system in the sense that the operation is not assumed to result from a supervisor's choice but from the users' trade-off. The solution to the problem is found using a game theory approach in both the noncooperative and the cooperative situations. In both cases, under reasonble additional hypotheses about the economic context of the system it is possible to find a solution to the game. Such a solution can be found by means of an efficient search algorithm to be run easily on a computer. Discussed first are the decision variables, the assumptions about the economy, and the decision-making structure of the system. Considered next is the problem solution; the shapes of the feasible regions of the optimization problems presented are examined, and both the noncooperative case and the cooperative case are considered. Summarized are the results of a simulation carried out with data taken from the Lake Maggiore system in northern Italy. A basic criticism is made of use of the game theory approach to solve the problem of operating a reservoir in the presence of two decision makers. The game theory postulates a 'rational behavior' of the players as well as the existence of an accepted or imposed bargain rule. (Bell-Cornell)
W77-07536

CAPACITY EXPANSION AND OPERATIONAL PLANNING FOR REGIONAL WATER-RESOURCE SYSTEMS,
General Motors Corp., Cleveland, Ohio. Fisher Body.
For primary bibliographic entry see Field 6B.
W77-07538

SATURATED AND UNSATURATED FLOW TO PARALLEL DRAINS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs, and Y-K. Tang.
Journal of the Irrigation and Drainage Division, Proceedings of the Society of American Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12199, p 221-238, June 1976. 14 fig, 19 ref.

Descriptors: *Drains, *Drainage, *Unsaturated flow, *Groundwater, Porosity, Equations, Numerical analysis, Effects, Design, Drawdown, *Saturated flow.
Identifiers: Field investigations, Transient flow, Richards equation, Boussinesq equation.

Richards equation for transient two-dimensional flow during drainage was solved using numerical methods and the solutions compared to solutions of the more approximate Boussinesq equation. The effect of field variability of the soil properties on solutions to the Richards equation was also examined. For the cases studied, the hydraulic head distributions predicted by the Richards equation were in general agreement with the D-F assumptions except for times near t = 0. Convergence near drainage ditches is more critical immediately after drainage begins than for latter times. It results in a surface of seepage for ditches and water standing over the drain for drain tubes. When convergence near the drain is accounted for, solutions to the Boussinesq equation can be used to adequately predict drawdown for design purposes. Unless enough measurements are made to define field-effective values of the unsaturated soil-water properties, there is little to be gained by solving the Richards equation rather than using simpler approximate methods for drawdown prediction. (Bell-Cornell)
W77-07552

SOLUTIONS TO GREEN-AMPT INFILTRATION EQUATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R-M. Li, M. A. Stevens, and D. B. Simons.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12196, p 239-248, June 1976. 1 fig, 1 tab, 14 ref.

Descriptors: *Irrigation, *Surface waters, *Approximation method, Hydrology, Flow, *Infiltration, Mathematics, Nonlinear differential equations, Darcys Law.
Identifiers: Nonlinear differential equations, Errors.

The simple method of solving the Green-Ampt one-dimensional infiltration equations developed from Darcy's law are proposed for practical applications. The explicit solution is an approximation obtained by employing a power series expansion of the logarithmic term. The maximum error resulting from applying this simple explicit solution is 8%. The implicit 'exact' solution is obtained by refining the explicit solution using the second-order Newton method. The maximum error resulting from employing the implicit solution is 0.003%. These new methods have advantages over other existing solutions in that they are derived from the theory of mathematics and the errors due to approximation can be evaluated theoretically. Moreover, the two methods are simple and easy to use either with a desk calculator or in a digital computer, and they are applicable without limitation on ranges. (Bell-Cornell)
W77-07553

4B. Groundwater Management

NITRATE IN GROUND WATER AND ITS RELATION TO FERTILIZATION, (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 5B.
W77-07112

BIBLIOGRAPHY AND INDEX OF NORTH DAKOTA WATER RESOURCES 1878-1970,
North Dakota Univ., Grand Forks.
For primary bibliographic entry see Field 10C.
W77-07140

NITROGEN CONTAMINATION SOURCES IN SHALLOW GROUND WATER, LAS VEGAS AREA, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 5B.
W77-07141

TYPE CURVES FOR ANALYSIS OF PUMP TESTS IN LEAKY STRIP AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2F.
W77-07145

FINITE-ELEMENT ANALYSIS OF GROUNDWATER FLOW IN MULTIAQUIFER SYSTEMS, I. THE BEHAVIOR OF HYDROLOGICAL PROPERTIES IN AN AQUITARD WHILE BEING PUMPED,
Kyoto Univ. (Japan). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W77-07148

INTERCONNECTION OF SURFACE AND UNDERGROUND WATER RESOURCES IN SOUTHEAST DURHAM,
Teesside Polytechnic, Middlesborough (England). Dept. of Civil and Structural Engineering.
T. Cairney, and L. Hamill.
Journal of Hydrology, Vol. 33, No. 1/2, p 73-86, March 1977. 7 fig, 2 tab, 5 ref, 1 append.

Descriptors: *Rivers, *Aquifers, *Groundwater recharge, Flow, Streamflow, Base flow, Groundwater, Surface waters, Rainfall, Runoff, Hydrographs, Watersheds(Basins), Mine water, Coal mines, Recharge, Water levels, On-site investigations, Foreign research, Foreign countries, Hydrology.
Identifiers: *England, *River Skerne.

The River Skerne and the Underlying Magnesian Limestone have been regarded as essentially separate water resources. The present study indicated that this view is incorrect and that groundwater exploitation from the Magnesian Limestone is progressively inducing River Skerne flows to recharge the aquifer. (Sims-ISWS)
W77-07149

SPECIFIC YIELD DETERMINATIONS FROM A CONSOLIDATED SANDSTONE AQUIFER,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 2F.
W77-07153

APPLICATION OF NITROGEN-ISOTOPE STUDIES TO HYDROLOGY AND HYDROGEOLOGY--ANALYSIS OF THE PECULIAR CASE OF THE MELARCHEZ BASIN (SEINE-ET-MARNE, FRANCE) (APPLICATION DE L'ETUDE ISOTOPIQUE DE L'AZOTE EN HYDROLOGIE ET EN HYDROGEOLOGIE--ANALYSE DES RESULTATS OBTENUS SUR UN EXEMPLE PRECIS: LE BASSIN DE MELARCHEZ (SEINE-ET-MARNE, FRANCE)),
Centre National de la Recherche Scientifique, Paris (France). Laboratoire de Geologie Dynamique.
For primary bibliographic entry see Field 5B.
W77-07154

A LIGHT-WEIGHT AND CHEAP DEPTH SAMPLER,
Teesside Polytechnic, Middlesborough (England).
For primary bibliographic entry see Field 5A.
W77-07155

CALCULATION OF THE LEAKY AQUIFER FUNCTION,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-07156

LEACHING CHARACTERISTICS OF POLLUTED DREDGINGS,
Hayward Baker Co., Odenton, Md.
For primary bibliographic entry see Field 5B.
W77-07158

LOCATION OF FREE SURFACE IN POROUS MEDIA,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W77-07162

BRACE RESEARCH INSTITUTE, ANNUAL REPORT, (1976),
Macdonald Coll. Montreal (Quebec). Brace Research Inst.
For primary bibliographic entry see Field 3A.
W77-07242

CONSUMPTIVE USE OF GROUND WATER,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07257

ARTESIAN WELLS AND STORAGE RESERVOIRS, AND WORKS CONNECTED THEREWITH.
For primary bibliographic entry see Field 6E.
W77-07263

APPROPRIATION OF WATER--PERMITS, CERTIFICATES AND LICENSES--SURVEY.
For primary bibliographic entry see Field 6E.
W77-07265

ENTEROVIRUS AND BACTERIOPHAGE INACTIVATION IN SUBSURFACE WATERS AND TRANSLOCATION IN SOIL,
New Mexico State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W77-07283

THE CHIEF DRILLER'S REPORT ON JCCIP,
Christian Organization for Relief and Rehabilitation, New York.
For primary bibliographic entry see Field 8C.
W77-07288

GEOLOGISTS CLAIM HEALTH CAN BE TRACED TO ROCKS,
For primary bibliographic entry see Field 5B.
W77-07290

DEEP WELLS FOR DEWATERING OFFER REAL ADVANTAGES, PART I.
For primary bibliographic entry see Field 8B.
W77-07294

DEEP WELL INJECTION: SWEEPING THE PROBLEM UNDER THE CARPET,
For primary bibliographic entry see Field 5G.
W77-07295

GEOTHERMAL POWER, THE 'SLEEPER' IN THE ENERGY RACE,
Magma-Thermal Power Project, Santa Rosa, Calif.
For primary bibliographic entry see Field 3E.
W77-07296

ELECTRIC POWER GENERATION FROM GEOTHERMAL HOT WATER DEPOSITS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 8C.
W77-07300

GEOTHERMAL ENERGY: NEEDED, EFFECTIVE HEAT TRANSFER EQUIPMENT,
International Society for Geothermal Engineering, Whittier, Calif.
For primary bibliographic entry see Field 8G.
W77-07301

GEOTHERMAL SYSTEMS AND POWER DEVELOPMENT,
Department of Scientific and Industrial Research, Auckland (New Zealand).
A. J. Ellis.
American Scientist, Vol. 190, No. 5, p 510-521, September, 1975. 6 fig, 2 tab, 43 ref.

Descriptors: *Geothermal studies, *Thermal power, *Electric power generation, Geysers, Hot springs, Convection, Steam, Dissolved solids, Brines, Environmental effects, Brine disposal, Remote sensing.
Identifiers: Crustal plate divergence, Crustal plate subduction.

Although hot springs are found throughout the world, geothermal systems with water temperatures above 100 degrees C within 1-2 km of the surface are limited to scattered areas, generally areas of crustal plate divergence or subduction. Geothermal water and steam vary greatly throughout the world with respect to temperature and proportion of dissolved solids and gases. Aerial infrared surveys, geochemical analysis, and electrical resistivity surveys are useful techniques for assessing and delineating geothermal fields, while test drilling remains the only real check of actual production capabilities. Only a few large geothermal power stations exist today, most of which operate in fields with temperatures exceeding 220 degrees C. Relative inefficiency of geothermal energy conversion and problems with disposal of spent effluent brines make it unlikely that developed countries will make extensive use of this resource in the future, although developing countries in the Pacific Basin and in Latin America will probably find it invaluable. Future applications of downhole heat exchange equipment will alleviate much of the disposal problem. A few unusual and highly efficient industrial uses of geothermal sources in New Zealand and Iceland combine power generation with direct steam or hot water utilization of the waste fraction. (Eberle-NWWA)
W77-07302

PHYSICAL MODELING OF COMBINED FORCED AND NATURAL CONVECTION IN WET GEOTHERMAL FORMATIONS,
California Univ., Berkeley. Lawrence Berkeley Lab.
V. E. Schrock, and A. D. K. Laird.
ASME Journal of Heat Transfer, Vol. 98, No. 2, p 213-220, May, 1976. 12 fig, 17 ref, append.

Descriptors: *Geothermal studies, *Heat flow, *Convection, Water circulation, Water temperature, Energy transfer, Thermal water, Thermal power, Porous media, Injection, Groundwater recharge, *Model studies.
Identifiers: *Wet geothermal systems.

Wet geothermal formations or reservoirs are of great current interest as a new energy source. Because of very high concentrations of dissolved solids in most geothermal waters, reinjection of geothermal water after energy has been extracted will be practiced in many cases. Optimum locations of producing and injection wells can only be determined with a knowledge of heat and mass flow within the reservoir. In this study, experiments were performed on the combined effects of forced and natural convection in a liquid-saturated porous medium in a system intended to simulate a wet geothermal system. Flow patterns inferred by temperature field measurements reveal a natural convection effect that develops slowly and is most pronounced when the source flow is low and the temperature difference is large. Results will be useful as a first step toward developing the capability to physically model wet geothermal systems. (Eberle-NWWA)
W77-07303

HYDROGEOLOGICAL APPLICATIONS OF EARTH RESOURCES TECHNOLOGY SATELLITE LANDSAT 1 IMAGERY,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7B.
W77-07339

UTILIZATION OF THE RESULTS FROM REPRESENTATIVE AND EXPERIMENTAL BASINS WITH A VIEW TO THE MANAGEMENT OF WATER RESOURCES,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-07355

EFFECTS OF MAN'S ACTIVITIES ON GROUNDWATER QUALITY,
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 5B.
W77-07359

ANTHROPOGENICALLY REDUCED GROUNDWATERS,
Coblenz Federal Inst. of Hydrology (West Germany).
For primary bibliographic entry see Field 5B.
W77-07360

INORGANIC CONTAMINANTS IN RURAL DRINKING WATERS,
South Carolina State Coll., Orangeburg. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-07372

A STUDY OF ENVIRONMENT SANITATION ON THE WELLS IN JUNGNEUNG-DONG AREA, SEOUL, (IN KOREAN),
Korea Univ., Seoul. Coll. of Medicine.
For primary bibliographic entry see Field 5B.
W77-07475

ASSESSMENT OF GEOTHERMAL RESOURCES OF THE UNITED STATES--1975.
Geological Survey, El Paso, Tex.; and Geological Survey, Albany, N.Y. Water Resources Div.
Available from U S Geological Survey, Reston, VA 22092. Circular 726, 1975. 155 p, 16 fig, 28 tab, 6 ref, append. D. F. White and D. L. Williams, Editors.

Descriptors: *Geothermal studies, *Thermal springs, *Steam, *Energy transfer, *Electric power, Convection, Hydrogeology, Heat flow, Thermal properties, Evaluation, Supply, *United States.
Identifiers: *Geothermal energy, *Geothermal resources(USA).

This assessment of geothermal resources of the United States consists of two major parts: (1) estimates of total heat in the ground to a depth of 10 km and (2) estimates of the part of this total heat that is recoverable with present technology, regardless of price. No attempt has been made to consider most aspects of the legal, environmental, and institutional limitations in exploiting these resouces. In general, the average heat content of rocks is considerably higher in the Western United

States than in the East. This also helps to explain why the most favorable hydrothermal convection systems and the hot young igneous systems occur in the West. Resources of the most attractive identified convection systems (excluding national parks) with predicted reservoir temperatures above 150 deg C have an estimated electrical production potential of about 8,000 megawatt century, or about 26,000 megawatt for 30 years. Assumptions in this conversion are: (1) one-half of the volume of the heat reservoirs is porous and permeable, (2) one-half of the heat of the porous, permeable parts is recoverable in fluids at the wellheads, and (3) the conversion efficiency of heat in wellhead fluids to electricity ranges from about 8 to 20 percent, depending on temperature and kind of fluid (hot water or steam). The estimated overall efficiency of conversion of heat in the ground to electrical energy generally ranges from less than 2 to 5 percent, depending on type of system and reservoir temperature. (See also W77-07477) (Woodard-USGS)
W77-07476

GEOTHERMAL RESOURCES, A NEW LOOK,
A. L. Hammond.
Science, Vol. 190, No. 4212, p 370, October 24, 1975.

Descriptors: *Thermal power, *Electric power production, *Geothermal studies, Thermal water.
Identifiers: Magma chambers, Geopressured zones.

A recent assessment by the USGS (Circular 726) (See W77-07476) underlines how limited current use of geothermal energy potential is in this country. The report provides conservative estimates to the effect that an electric generating capacity of 12000 megawatts, 15 times the current U.S. output from geothermal sources, could be achieved at present energy prices and with current technology. Nearly 10 times that resource either remains to be discovered or awaits improved technology for its exploitation. Main interest at present is in geothermal deposits in which heat is transferred by hydrothermal convection. As with mineral resources, much geothermal heat seems to concentrate in a few large deposits, with some particularly outstanding areas located in California, New Mexico, and the Bruneau-Grandview area of Idaho. Geologically recent magma chambers and the geopressured zone of the Texas-Louisiana gulf area hold promise for the future as drilling and well technology advance with respect to tapping high temperature and high pressure sources, and as energy prices increase. (Eberle-NWWA)
W77-07477

PRELIMINARY MAPS SHOWING GROUNDWATER RESOURCES IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07478

ANALOG-MODEL ANALYSIS OF REGIONAL THREE-DIMENSIONAL FLOW IN THE GROUND-WATER RESERVOIR OF LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-07479

MAJOR AQUIFERS IN DEUEL AND HAMLIN COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak. Water Resources Div.
J. Kume.
South Dakota Geological Survey, Vermillion, Information Pamphlet No 11, 1976. 4 p, 5 fig.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, Water wells, Water yield, Pumping, Water utilization, Aquifer systems, *South Dakota.
Identifiers: Deuel and Hamlin Counties(S Dak).

Four major glacial sand and gravel outwash aquifers underlie about 50 square miles, are generally less than 20 feet and may yield from 50 to 150 gallons per minute (gpm) to domestic, stock, and public-supply wells. The water in the aquifer is fresh and a calcium bicarbonate type. The Big Sioux aquifer underlies about 180 square miles, averages about 30 feet in thickness, and may yield as much as 1,000 gpm to domestic, stock, irrigation, and public-supply wells. The water in the aquifer is fresh and varies from a calcium bicarbonate to a calcium sulfate type in different areas. The Prairie Coteau aquifer occurs throughout most of Deuel and Hamlin Counties. The combined thicknesses of sand and gravel beds encountered in test holes ranged from 3 to 144 feet. This aquifer may yield as much as 250 gpm to domestic, stock, and irrigation-supply wells. The water in the aquifer is slightly saline and varies from a calcium sulfate to a calcium bicarbonate type in different areas. The Altamont aquifer underlines about 800 square miles, averages about 35 feet in thickness, and may yield as much as 500 gpm to stock wells. The water in this aquifer is slightly saline and varies from a sodium sulfate to a calcium sulfate type in different areas. The Dakota aquifer, the major bedrock aquifer, is composed of fine- to medium-grained sandstone which is from 60 feet to as much as 113 feet thick. The water is of poor quality for domestic use and certain other uses. It is moderately saline and of a sodium sulfate type. (Woodard-USGS)
W77-07483

GROUND-WATER LEVELS IN MASSACHUSETTS, 1936-74,
Geological Survey, Boston, Mass. Water Resources Div.
A. Maevsky.
Massachusetts Dept. of Public Works, Boston, Hydrologic-Data Report No 17, 1976. 107 p, 2 figs, 2 tab.

Descriptors: *Observation wells, *Water levels, *Groundwater, *Water temperature, *Massachusetts, Well data, Sites, Aquifers, Water level fluctuations, Hydrographs.

Water-level data collected from 87 observation wells in Massachusetts between 1936 and 1974 are presented. The data are in tabular and graphic forms. Also included are locations and descriptions of the wells and ground-water temperatures. (Woodard-USGS)
W77-07485

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1973-77,
Geological Survey, Lakewood, Colo. Water Resources Div.
T. J. Major, R. G. Borman, and K. D. Vaught.
Open-file report 77-160, February 1977. 30 p, 2 fig, 1 tab.

Descriptors: *Water level fluctuations, *Water wells, *Irrigation wells, *Colorado, Basic data collections, Water levels, Well data, Aquifers, Water utilization, Great Plains.
Identifiers: *Northern high plains(Colo).

Water-level measurements were made in more than 600 wells during January 1977 in the northern High Plains of Colorado which includes about 9,500 square miles. Most of these wells were irrigation wells, but several stock and government-owned wells were also measured, especially in areas where there is little irrigation. Changes in water levels from January 1976 to January 1977 ranged from a rise of about 12 feet (3.7 meters) to a decline of about 10 feet (3 meters), both of which occurred in Kit Carson County. Measurements for the four preceding winters also are included to serve as references illustrating declining or rising water levels. (Woodard-USGS)
W77-07486

CHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07487

CONVECTIVE HEAT FLOW FROM HOT SPRINGS IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07488

GEOCHEMISTRY OF THERMAL WATERS IN LONG VALLEY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-07489

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07491

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-07492

MANAGEMENT MODEL FOR GROUND WATER DEVELOPMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis, and B. A. Newman.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12953, p 159-171, May 1977. 1 fig, 3 tab, 29 ref.

Descriptors: *Groundwater resources, *Aquifers, *Mathematical models, *Water management(Applied), *Optimization, Water supply, Economic efficiency, Water demand, Long-term planning, Finite element analysis, Flow, Control, Wells, Pumping, Equations, Systems analysis, Linear programming, Algorithms, Water resources development.
Identifiers: Control theory, Management systems, Cost minimization.

A mathematical model for the optimal dynamic management of regional groundwater supply resources is presented. The model, predicated upon a Galerkin finite element formulation of flow in heterogeneous anisotropic porous media, allows management decisions to be made regarding; (1) the possible well development sites within the

ground water basin; and (2) the optimal pumping rates needed to meet an exogenous water demand in each planning period. The planning model minimizes the total discounted operational costs over the planning horizon. The algorithm solves a succession of linear programming problems obtained by linearizing the concave objective function using a generalized Taylor series expansion about an initial feasible decision vector. The management problem, structured as a problem in optimal control, is solved using Tui's concave programming algorithm. Results indicate the effectiveness of the model for the planning and development of ground-water resources. (Bell-Cornell)
W77-07529

WATER QUALITY AND AQUITARD PERMEABILITY,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-07551

SATURATED AND UNSATURATED FLOW TO PARALLEL DRAINS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W77-07552

THE CHANGES IN INORGANIC NITROGEN CONCENTRATION OF DRINKING WATER FROM WELLS OVER A TWO YEAR PERIOD IN ANI-MACHI, IBARAKI PREFECTURE, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07570

4C. Effects On Water Of Man's Non-Water Activities

OBSERVATIONS ON A PEAT BOG'S ABILITY TO WITHSTAND INCREASING PUBLIC PRESSURE,
University of Wales Inst. of Science and Technology, Cardiff.
For primary bibliographic entry see Field 5C.
W77-07139

FIRE EFFECTS ON WATER SUPPLY, FLOODS, AND SEDIMENTATION,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
H. W. Anderson.
In: Proceedings Conference on Fire Ecology of the Pacific Northwest, Portland, Oregon, October 16-17, 1974, Oregon State U., Univ. Washington. Tall Timbers No. 15, p 249-260, 1976. 30 ref.

Descriptors: *Water supply, Streamflow, *Water quality, Sedimentation, Suspended sediment, Erosion, Floods, *Forest fires, *Burning, Mountain forests, Watersheds(Basins), Wood wastes, Soil physical properties, Forest management, Aquatic habitats, Stream chemistry, Ion transport, Nutrients, Forest ecology, Lumbering, *Pacific Northwest US.
Identifiers: *Fire hazard reduction, *Prescribed burning, Wildfires, Fuel breaks, Experimental forests, Multivariate analysis.

In the northwestern United States, forest fires and slash burning after logging have had striking hydrologic effects on timbered watersheds. Water quality has been altered, with turbidity increased by 4 to 67 times-- more than 80 ppm; summertime stream temperature raised by 13 to 16 degrees F., and stream oxygen content reduced to a degree deleterious to fish. Streamflow and flood water have increased after forest fires, with increases in annual flow ranging from 3.5 to 9 inches, and annual flood flows increases ranging from 10 to 20 percent. With repeated fires, detectable flow increases have persisted for as long as 17 years. Effects of fires on chemical water quality have been small except where surface runoff is involved; the acidic nature of forest soils has typically resulted in effectively buffering percolating chemicals released by burning. Post-fire use or treatment of burned areas may worsen or mitigate the hydrologic effects of burning. (Forest Service)
W77-07318

UTILIZATION OF THE RESULTS FROM REPRESENTATIVE AND EXPERIMENTAL BASINS WITH A VIEW TO THE MANAGEMENT OF WATER RESOURCES,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
For primary bibliographic entry see Field 4A.
W77-07355

EFFECTS OF MAN'S ACTIVITIES ON GROUNDWATER QUALITY,
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 5B.
W77-07359

ANTHROPOGENICALLY REDUCED GROUNDWATERS,
Coblenz Federal Inst. of Hydrology (West Germany).
For primary bibliographic entry see Field 5B.
W77-07360

SPATIAL AND TEMPORAL CHANGES IN THE PRIMARY PRODUCTIVITY OF LAKE TAHOE, CALIFORNIA-NEVADA BETWEEN 1959 AND 1971,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W77-07443

4D. Watershed Protection

SIMULATION OF A SERIES OF DAILY AREAL MEAN RAINFALLS FOR A BASIN USING RAINFALL OBSERVATIONS AT A REFERENCE STATION LOCATED OUTSIDE THE BASIN,
Institut Royal Meteorologique de Belgique, Brussels. Hydrology Section.
For primary bibliographic entry see Field 2B.
W77-07356

MANNING N AND THE OVERLAND FLOW EQUATION,
Agricultural Research Service, Stillwater, Okla.
For primary bibliographic entry see Field 2E.
W77-07371

RECONNAISSANCE OF SEDIMENT TRANSPORT AND CHANNEL MORPHOLOGY IN THE LOWER RIO BERMEJO BASIN, ARGENTINA--WITH A SECTION ON RECONNAISSANCE OF THE LOWER RIO PILCOMAYO BASIN, ARGENTINA AND PARAGUAY,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-07490

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE UTILIZATION OF DISSOLVED FREE AMINO ACIDS BY ESTUARINE MICROORGANISMS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07117

AN INDUSTRIAL VIEW OF BIOLOGICAL MONITORING,
FMC Corp., Philadelphia, Pa.
E. C. Ladd.
In: Biological Monitoring of Water and Effluent Quality, ASTM STP 607, J. Cairns, Jr., K. L. Dickson and G. F. Westlake, Eds., American Society for Testing and Materials, 1977, p 24-29, 4 ref.

Descriptors: *Pollutant identification, *Bioindicators, *Monitoring, *Water quality, *Effluents, *Industrial wastes, *Standards, *Waste treatment, Methodology, Regulation, Water quality control, Waste disposal.
Identifiers: *Biological monitoring, Industrial participation.

Biological monitoring is required, along with chemical and physical measurements, for complete assessment of the nature of industrial wastewaters and their impact on the quality of receiving waters. Various approaches to biological monitoring are discussed along with several examples of specific concerns of industry. The need and opportunities for industrial participation in development of biological methods are emphasized. (Katz)
W77-07126

THE DYNAMICS OF METALS IN THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA. II. ENVIRONMENTAL EFFECTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.
For primary bibliographic entry see Field 5C.
W77-07129

THE EVALUATION OF TOXIC EFFECTS OF CHEMICALS IN FRESH WATER BY USING FROG EMBRYOS AND LARVAE,
California Univ., Irvine. Dept. of Anatomy; and California Univ., Irvine. Dept. of Developmental and Cell Biology.
For primary bibliographic entry see Field 5C.
W77-07132

EXPERIMENTAL SUBSTANTIATION OF MAXIMUM PERMISSIBLE PROPACHLOR (RAMROD) CONCENTRATIONS IN WATER, (IN RUSSIAN),
Academy of Medicine, Sofia (Bulgaria). Center for Hygiene.
A. Strateva.
Gig Sanit 4, p 85-87, 1976.

Descriptors: *Pollutant identification, Reservoirs, Water pollution effects, *Organoleptic properties, Water quality standards, Potable water, Water supply, Pesticides, *Dystrophy, Rodents, Metabolism, *Toxicity, *Pesticide toxicity, Testing.
Identifiers: *Ramrod, *Propachlor.

Negative effects of Ramrod on organoleptic properties of water and the sanitary condition of water reservoirs in threshold and subthreshold

concentrations, respectively, were determined. Orally administered Ramrod in acute tests showed toxic effects on mice, rats and rabbits. The LD50 for rats was 950(860-1050) mg/kg, for rabbits 392 (272-565) mg/kg and for mice 290 (240-350 mg/kg. Long-term tests on rats showed low cumulative and high adaptive effects with characteristic clinical (weight loss, changes in peripheral blood, redox processes and protein metabolism) and pathomorphologic (dystrophic changes in liver and kidneys) pictures. The threshold and subthreshold doses for warm-blooded animals were established at 5 mg/kg and 0.5 mg/kg, respectively, and the extrapolated subthreshold dose for humans at 0.05 mg/kg. With a reliability factor of 10, the daily permissible dose for humans was established at 0.05 mg/kg. Permissible Ramrod concentrations for water reservoirs are suggested to be 1 mg/l for drinking water and fish-farming and 20k mg/l for irrigation.--Copyright 1976, Biological Abstracts, Inc.
W77-07133

QUEST FOR AN INDEX OF COMMUNITY STRUCTURE SENSITIVE TO WATER POLLUTION,
Oxford Polytechnic (England). Dept. of Biology.
S. E. K. Cook.
Environmental Pollution, vol. 11, p. 269-288, 1976. 3 fig., 8 tab., 26 ref.

Descriptors: *Pollutant identification, *Bioindicators, *Reviews, *Reliability, *Water quality, Water pollution, Water pollution effects, Biological communities, Dominant organisms, Water chemistry, Sampling, Statistics, Regression, Analysis, Productivity, Monitoring.
Identifiers: Shannon-Wiener Index, Chandler Score, Berger and Parker Dominance Index.

A review is presented of indices summarizing benthic macroinvertebrate data and uses of samples from an unpolluted lentic stream to test their sensitivity to various environmental parameters. The Shannon-Wiener index is evaluated against the qualitative Chandler score. Values of both indices and a modification of the Chandler score were regressed with the following environmental variables: temperature, total alkalinity, conductivity, per cent oxygen saturation, dissolved oxygen content, biochemical oxygen demand and coliform count. The Shannon-Wiener index is primarily sensitive to total alkalinity which may be an indirect measure of stream productivity. The dominance index of Berger and Parker (1970) is highly correlated with the Shannon-Wiener index and is very much simpler to use. The Chandler modification is well correlated with the coliform count and BOD, parameters which are associated with pollution. The Shannon-Wiener index emerged as a very imprecise, if not dubious, pollution index. The modification of the Chandler score gives the most reliable continuous assessment. (Katz)
W77-07136

A LIGHT-WEIGHT AND CHEAP DEPTH SAMPLER,
Teesside Polytechnic, Middlesborough (England).
R. C. Frost, T. F. Bernascone, and T. Cairney.
Journal of Hydrology, Vol. 33, No. 1/2, p 173-178, March 1977. 4 fig, 4 ref.

Descriptors: *Pollutant identification, *Water sampling, Equipment, *Coal mines, Mining, *Sampling, *Instrumentation, Dissolved solids, Iron, Dissolved oxygen, Water quality, Foreign research, Groundwater, Shafts(Excavations), Depth, Wells.

A need for water samples from considerable depths in flooded collieries was met by a specially designed lightweight and cheap sampling system which proved entirely satisfactory in operation. Field tests have proved the efficiency of the system design. It has proved possible to repeat samples without difficulty, and many depth profiles of water composition have been obtained. Although the basic aim was to overcome the lack of funds, recent tests with commercially available depth samplers have shown that the specially designed system is more convenient and accurate in operation. (Sims-ISWS)
W77-07155

STOCHASTIC PROPERTIES OF DAILY TEMPERATURE IN RIVERS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5B.
W77-07159

A NEW METHOD FOR PHYSICAL LIMNOLOGY--TRITIUM-HELIUM-3 AGES--RESULTS FOR LAKE ERIE, HURON, AND ONTARIO,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2H.
W77-07168

NONPOINT SOURCE EFFECTS ON WATER QUALITY,
Florida Technological Univ., Orlando.
For primary bibliographic entry see Field 5B.
W77-07173

DISSOLVED HELIUM IN LAKES: URANIUM PROSPECTING IN THE PRECAMBRIAN TERRAIN OF CENTRAL LABRADOR,
McMaster Univ., Hamilton (Ontario). Dept. of Physics.
W. B. Clarke, Z. Top, A. P. Beavan, and S. S. Gandhi.
Economic Geology, Vol. 72, No. 2, p 233-242, March-April 1977. 4 fig, 3 tab, 16 ref.

Descriptors: *Pollutant identification, *Helium, *Radioisotopes, *Uranium radioisotopes, *Exploration, Tracers, Geology, Tritium, Lakes, Sampling, Data collections, Mass spectrometry, Laboratory tests, Correlation analysis, Mineralogy, Isotope studies, *Canada.
Identifiers: *Uranium prospecting, *Labrador, *Neon, *Dissolved helium.

Measurements of dissolved helium, 3He/4He, and neon were made in 60 water samples collected from 56 lakes and ponds in the Kaipokok region in Labrador. Tritium was measured in 8 water samples. The aim of the survey was to search for excess 4He from decay of uranium and its daughter products. Excess 4He varied from about 0% to 65% relative to the equilibrium solubility concentration at the temperature of the sample. Delta (3He), the helium isotope ratio anomaly relative to atmospheric helium, varied from +11% to -25%. Although the effect of tritium decay in the water prior to sampling must be considered, there is a good correlation between the lakes which have delta (3He) -2% and lakes with excess radiogenic 4He greater than 4%. The helium results when plotted on a map of the area show a remarkable fit with the locations of known uranium mineralization. (Sims-ISWS)
W77-07174

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS I. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIERS FOR SOME MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07181

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-II. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIER COMPONENTS FOR MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-07182

RAPID DETERMINATION OF TOTAL ORGANIC CARBON AND ITS APPLICATION TO WATER RESEARCH, (IN JAPANESE),
Osaka City Inst. of Public Health and Environmental Sciences, (Japan).
T. Yoshikura, I. Fukunaga, K. Oda, S. Kawai, and G. Uno.
Bulletin of the Japanese Society of Scientific Fisheries Vol. 42(12), p. 1423-1429, 1976. 6 fig., 2 tab., 8 ref.

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Carbon, Aquatic bacteria, Bioindicators, *Organic wastes, *Water pollution, Water chemistry, Chemical analysis, Water quality, *Methodology, *Pollutant identification, Analytical techniques.
Identifiers: *Total organic carbon, *Kjeldhal nitrogen measurements.

The quality of water polluted with organic compounds is usually expressed in terms of COD and BOD. Recently, a rapid combustion method for measuring total organic carbon (TOC) content of water was developed. Therefore, the determination TOC in the river water polluted with organic compounds was attempted and compared with other pollution parameters: BOD, COD, NH4-N, and bacterial counts with the following results. The measurement of TOC was not significantly influenced by the presence of toxic substances, biodegradability, chemical structure, molecular weight of the organic substances of their susceptibility to chemical oxidants. TOC correlated well with BOD, COD, NH4-N, Kjeldhal-N, and bacterial counts. It was concluded from these results that TOC measurement would provide rapid and accurate analysis of the extent of organic pollution in water. (Katz)
W77-07183

EGG AND LARVAL SURVIVAL OF WHITE SUCKERS (CATOSTOMUS COMMERSONI) AT LOW PH,
Cornell Univ., Ithaca. N.Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W77-07184

RESIDUES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) UNDETECTED IN LAKE TROUT AND CHINOOK SALMON FROM THE UPPER GREAT LAKES,
Fish and Wildlife Service, Warm Springs, Ga. Southeastern Fish Control Lab.
J. B. Sills, and J. L. Allen.
The Progressive Fish-Culturist, Vol. 38, No. 4, p. 197, 1976. 1 tab., 2 ref.

Descriptors: Lampreys, Fish parasites, *Larvicide, *Pesticide, Residues, *Lake trout, *Chinook salmon, *Great Lakes, Biochemistry, *Chemical analysis, Chromatography, Pollutant identification.
Identifiers: Salvelinus namaycush, Oncorhynchus tshawytscha, Lampricide, Bioaccumulation, *TFM.

Samples of resident populations of Lake Trout and Chinook Salmon from the upper Great Lakes Region were found to have no residues of the lamprey larvicide 3-trifluoro-methyl-4-nitrophenol (TFM). The larvicide had been used in the area for 15 years. (Katz)
W77-07187

LABORATORY APPARATUS FOR PROVIDING DIEL TEMPERATURE REGIMES FOR AQUATIC ANIMALS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-07188

ACUTE TOXICITY OF ZINC, CADMIUM, AND CHROMIUM TO THE MARINE FISHES, YELLOW-EYE MULLET (ALDRICHETTA FORSTERI C. AND V.) AND SMALL MOUTHED HARDYHEAD (ATHERINASOMA MICROSTOMA WHITLEY),
Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.
For primary bibliographic entry see Field 5C.
W77-07190

SURBER SAMPLING IN DEEP WATER FOR BOTTOM ORGANISMS,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 7B.
W77-07199

A HAND-OPERATED IN SITU WATER SAMPLER,
Liverpool Univ. (England). Dept. of Oceanography.
M. I. Abdullah, and R. H. Tennant.
Freshwater Biology, Vol. 6, No. 3, p. 201-202, 1976. 1 fig., 1 plate, 2 ref.

Descriptors: *Water sampling, *Equipment, Sampling, *Dissolved oxygen, On-site data collections, Testing, Reliability, Water chemistry, Methodology, Laboratory equipment, Water quality, Pollutant identification.
Identifiers: *Dissolved gases, Contamination.

A hand-operated water sampler designed specifically for dissolved gas studies in lakes, lagoons and other shallow water is described. (Katz)
W77-07200

APPARENT POTENTIATION OF THE COTTON DEFOLIANT DEF BY METHYL PARATHION IN MOSQUITOFISH,
Mississippi Univ. for Women, Columbus. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-07204

EVALUATION OF TWO METHODS FOR CALCULATING FRESHWATER ZOOPLANKTON PRODUCTION, (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
For primary bibliographic entry see Field 7B.
W77-07228

GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 41, No. 232, p. 52780-86, December 1, 1976.

Descriptors: *Pollutant identification, *Permits, *Testing procedures, *Water analysis, *Monitoring, Water pollution control, Legal aspects, Administrative agencies, Legislation, Regulation, State governments, Local governments, Federal government, Measurement, Evaluation, Quality control, Sampling, Data collections, Water pollution sources.
Identifiers: FWPCA Amendments of 1972, Administrative regulations, Test parameters.

Amendments to the Guidelines Establishing Test Procedures for the Analysis of Pollutants were proposed pursuant to section 304(g) of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. Such test procedures are to be used by permit applicants demonstrate that effluent discharges meet applicable pollutant discharge limitations and by the states and other enforcement activities in routine or random monitoring of effluents to verify compliance with pollution control measures. Comments to the proposed amendments were received from various federal, state and local agencies, as well as regulated major dischargers, analytical instrument manufactures and service laboratories. Based upon a review of the comments, various changes to the proposed amendments were made. Among the principal changes were: (1) a clarification of certain test parameters, (2) an addition of 44 new parameters, and (3) a deletion of certain measurement techniques. Despite certain objections from various manufactures, applications for approval of alternate test procedures will continue to be made only by National Pollution Discharge Elimination System (NPDES) permit holders with approval of such applications to be made on a case-by-case basis by the Regional Administrator. (Rieck-Florida)
W77-07252

PROPOSED TOXIC POLLUTANT EFFLUENT STANDARD FOR POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-07253

THE DIFFERENTIAL USE OF CHIRONOMIDAE AND CERATOPOGONIDAE (DIPTERA) IN THE MONITORING OF VARIOUS AQUATIC WASTES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Entomology.
E. C. Turner, Jr., and Walter I. Knausenberger.
Available from the National Technical Information Service, Springfield VA 22161 as PB-266 713, Price codes: A03 in paper copy, A01 in microfiche. Completion report, (1977). 46 p, 7 fig, 33 ref. OWRT A-042-VA(1).

Descriptors: *Diptera, *Midges, *Littoral, Mosquitos, *Virginia, Larvae, *Monitoring, *Bioindicators, Toxicity, Sewage effluents, Heavy metals, Sampling, *Pollutant identification.
Identifiers: Multiple-plate samplers, *Mosquito larvae, Tanytarsini, Toxicity tests, Negative phototaxis, Rapid biological monitoring, Culicoides, Aedes algypti.

Based on larval and adult determinations, 73 chironomid and 26 ceratopogonid taxa were recognized in a two-year survey of four polluted watercourses in southwestern Virginia. Comparative analysis of the midge community in two streams indicated strongly that larval midges can be used profitably to monitor water quality when the effluent is mixed heavy metal and domestic sewage. The chironomid tribe Tanytarsini and the ceratopogonid Culicoides were particularly sensitive. Community diversity d, equitability 'e,' and several methods of quantitative comparison among stations were validly applicable to the community of mides alone. A littoral sampling technique was compared with modified multiple-plate artificial substrates for the species each method collected. The littoral samples yielded significantly higher coefficients of variation, lower densities and fewer taxa than the multiple-plate substrates, but the investigation of the littoral fauna is an expedient method of assessing pollutional impact on smaller streams. An objectively quantifiable toxicity test involving the negative phototactic behavior of Aedes aegypti (Diptera:Culicidae) larvae was developed. It measured the progressive decrease in locomotory ability, i.e., enfeeblement, of the larvae in solutions of copper and zinc. Objective evidence of toxicity was obtained in one to six hours, significantly sooner than any other means of assessing toxicity in mosquito larvae.
W77-07282

THE OLIGOCHAETE COMMUNITIES OF A LOWLAND STREAM AND THEIR VALUE AS INDICATORS OF ORGANIC POLLUTION,
Bordeaux-1 Univ., Talence (France). Comparative Anatomy Lab.; and Bordeaux-1 Univ., Talence (France). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W77-07307

ATOMIC ABSORPTION MEASUREMENTS OF LEAD, CADMIUM, COPPER, IRON, AND ZINC IN SESTON OF THE BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
H.-P. Weigel.
Helgolander Wissenschaftliche Meeresuntersuchungen, Vol 28, p 206-216, 1976. 3 fig, 3 tab, 26 ref.

Descriptors: *Heavy metals, *Zinc, *Cadmium, *Lead, *Copper, *Iron, *Path of pollutants, *Absorption, *Seston, *Aquatic microorganisms, Metals, Analytical techniques, On-site data collections, Spectroscopy, Chemical analysis, Water quality, *Pollutant identification.
Identifiers: *Baltic Sea, *Bioaccumulation, *Atomic absorption analysis.

Seston samples collected from 23 stations between Finnish Bay and Kiel Bight were analyzed for lead, cadmium, copper, iron and zinc by flameless atomic absorption spectrometry. The mean values for lead and cadmium were 123 and 5.8 ppm, respectively; for zinc, 733 ppm, for copper, 61 ppm, and for iron, 3535 ppm. In contrast to trace-metal analyses of off-shore seston, the concentrations for lead and cadmium in Baltic Sea seston are very high. These results agree with analyses for dissolved metals. The concentrations of zinc, copper and iron in the particulate matter from the Baltic Sea, apart from some local influences, agree well with values published from the concentrations in off-shore seston. The distribution and variation of individual values are discussed. (Katz)
W77-07309

PCB CONTENTS IN THE MUSCLE OF MARINE ANIMALS COLLECTED IN THE SEA NEAR HAKODATE (IN JAPANESE),
Hokkaido Univ., Hakodate (Japan). Lab. of Food Hygiene.
For primary bibliographic entry see Field 5C.
W77-07315

LONG ISLAND BEACH POLLUTION: JUNE 1976,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W77-07325

OBSERVATIONS ON BACTERIOLOGICAL CONDITIONS IN THE UPPER GREAT LAKES 1968-1974,
Canada Centre for Inland Waters, Burlington (Ontario).
S. S. Rao.
Scientific Series No 64, 1976, Ottawa, Canada, 31 p, 11 fig, 20 ref, 12 tab.

Descriptors: *Great Lakes, *Lake Huron, *Lake Superior, *Bacteria, *Environmental effects, Parametric hydrology, Coliforms, Water pollution, Wastes, Pollutant identification, Data collections, Bacteriology.
Identifiers: *Georgian Bay(1968 to 1974), Bacteriological data(Great Lakes).

Results are presented of bacteriological data collected on Lake Superior in 1968, 1971 and 1973; on Lake Huron in 1968, 1969, 1970, 1971 and 1974; and on Georgian Bay in 1971 and 1974. As part of the International Joint Commission (IJC) Upper Lakes Study, information which complies with the objectives outlined in the IJC Great Lakes Water Quality Agreement has been prepared. The report describes near-shore lake-wide bacterial levels showing their temporal and spatial variations. Information is also included which gives the existing bacterial base-line levels in the main bodies of Lake Superior, Lake Huron and Georgian Bay, and indicates near-shore areas with elevated bacterial levels (potential problem areas or areas of non-compliance). (WATDOC)
W77-07340

OCCURRENCE AND DETERMINATION OF A HERBICIDE BENTHIOCARB IN RIVERS AND AGRICULTURAL DRAINAGES,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
M. Suzuki, Y. Yamato, and T. Akiyama.
Water Research, Vol 11, No 3, p 275-279, 1977. 4 fig, 5 tab, 8 ref.

Descriptors: *Herbicides, *Weed control, *Agricultural chemicals, *Pollutant identification, Analytical techniques, Aquatic weed control, Computers, Analysis, Chemical analysis, Gas chromatography, Water analysis, Mass spectrometry, Rice, Instrumentation, Agricultural runoff, Foreign countries, Foreign research.
Identifiers: *Japan, *Benthiocarb, *Agricultural drainages, *Benthiocarb determination, Benthiocarb residues, Photo-chemical reactions.

The occurrence and determination of a herbicide, benthiocarb, 4-chloro-benzyl N,N-diethylthiolcarbamate in rivers and agricultural drainages were investigated. Benthiocarb residues were detected in water samples when it had been applied to rice paddies, after rice seedling transplantation, in concentrations of between 10.00 and 0.11 micrograms/l. The residues entered into rivers and agricultural drainages as a result of overflows from rice paddies. However, benthiocarb residues could not be found in water samples after the termination of its application to rice paddies, suggesting that the applied benthiocarb might be degraded by microbial and physicochemical actions such as photochemical reactions occurring on the soil surface. Benthiocarb residue levels were higher in longer rivers than in agricultural drainage. The contribution of rainfall to the benthiocarb concentrations was shown. Benthiocarb in water was extracted with n-hexane and identified by a gas chromatography using a flame photometric detector (sulphur filter 394 nm) and a combined gas chromatography-mass spectrometry-computer system. The minimum detectable amount of benthiocarb in water sample by gas chromatography was 0.56 ng, and about 100 ng of benthiocarb could be identified by a gas chromatography-mass spectrometry-computer system. (Henley-ISWS)
W77-07361

THE ANALYSIS OF AMMONIA IN POLLUTED SEA WATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
B. L. Hampson.
Water Research, Vol 11, No 3, p 305-308, 1977. 3 fig, 1 tab, 13 ref.

Descriptors: *Ammonia, *Chemical analysis, *Pollutant identification, *Sea water, *Ammonium compounds, *Analytical techniques, Nitrogen compounds, Nitrogen, Water pollution sources, Water quality, Nitrates, Nitrites, Amino acids, Fish, Ultraviolet radiation, Colorimetry, Water analysis, Chemistry, Water pollution, Aquatic environment.
Identifiers: *Ammonium analysis, *Ammonium content, Indophenol blue reaction, Ammonium determination.

Measurement of ammonia in polluted seawater or freshwater is important, especially in fish rearing. However, existing methods for the determination of ammonia are subject to serious suppression interference by many substances, including all types of amines, nitrite, and amino acids, which may participate in the chain of reactions employed diverting it. Some methods suffer from breakdown of amino acids to ammonia. Hydrogen sulphide, often present in anoxic waters, also interferes and must be removed. The reported method overcomes the mentioned difficulties by internal standard calibration and by specific u.v. photo-activation of the required ammonia yields indophenol blue reaction at low temperature. (Henley-ISWS)
W77-07362

DYNAMICS OF O2 AND CO2 EXCHANGE, PHOTOSYNTHESIS, AND RESPIRATION IN RIVERS FROM TIME-DELAYED CORRELATIONS WITH IDEAL SUNLIGHT,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07364

FURTHER TRANSITION STATES OF THE BAJA CALIFORNIA UPWELLING ECOSYSTEM,
Brookhaven National Lab., Upton, N.Y. Oceanographic Sciences Div.
For primary bibliographic entry see Field 5C.
W77-07365

PHOSPHORUS AND CARBON DISTRIBUTIONS IN A POLLUTED COASTAL ENVIRONMENT,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W77-07368

INORGANIC CONTAMINANTS IN RURAL DRINKING WATERS,
South Carolina State Coll., Orangeburg. Dept. of Chemistry.
S. S. Sandhu, W. J. Warren, and P. Nelson.
American Water Works Association Journal, Vol 69, No 4, p 219-222, April 1977. 3 fig, 3 tab, 26 ref.

Descriptors: *Water pollution sources, *Rural areas, *Potable water, *South Carolina, Pollutants, *Pollutant identification, Path of pollutants, Water pollution sources, Wells, Water wells, Plumbing, Septic tanks, Inorganic compounds, Metals, Heavy metals, Turbidity, Sampling, On-site investigations, Laboratory tests.
Identifiers: Chesterfield County(SC).

A total of 217 potable water samples, from rural communities and farm families of Chesterfield County, South Carolina, was drawn randomly to evaluate inorganic contents and to determine whether any sources polluting the water could be identified. The findings of this survey showed that quite a few people were using substandard quality waters. Many of the open wells were infested with macroorganisms. Metallic contamination was quite common, and the levels of arsenic, iron, lead, mercury, and manganese, in some cases, were far above the mandatory limits. Low, but generally acceptable, concentrationss of nitrate, phosphate, chloride, fluoride, cadmium, copper, zinc, and sodium were found. Statistical evidence suggests that seepage from the septic tank was at least partially responsible for contamination of shallow water supply sources. The lead and cadmium appeared to come from the corrosion of the antiquated plumbing in the old houses. (Sims-ISWS)
W77-07372

CARBON DIOXIDE AND OXYGEN-NITROGEN RATIOS AS FACTORS AFFECTING SALMON SURVIVAL IN AIR-SUPER-SATURATED WATER,
Corvallis Environmental Research Lab., Oreg. Western Fish Toxicology Station.
For primary bibliographic entry see Field 5C.
W77-07415

TOLERANCE OF SELECTED FISH SPECIES TO ATMOSPHERIC GAS SUPERSATURATION,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5C.
W77-07431

SUB-THERMOCLINE BIOMASS CONCENTRATION DETECTED BY TRANSMISSOMETER IN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W77-07447

PLUTONIUM IN THE LAURENTIAN GREAT LAKES: COMPARISON OF SURFACE WATERS,
For primary bibliographic entry see Field 5C.
W77-07449

PHOTOSYNTHETIC RATES IN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W77-07450

THE LARVAL SPIRURID NEMATODES OF FRESH-WATER CRUSTACEANS: I. THE IDENTIFICATION AND THE EXAMINATION OF THEIR PATHOGENICITY,
Niigata Univ. (Japan). Dept. of Medical Zoology.
For primary bibliographic entry see Field 5C.
W77-07458

TRIPTON SEDIMENTATION IN EUTROPHIC LAKES--SAMPLE CORRECTION FOR THE RESUSPENDED MATTER,
For primary bibliographic entry see Field 5C.
W77-07463

ALGAL SEDIMENTATION: THE CAUSE OF A DIATOM-BLUE-GREEN SUCCESSION,
For primary bibliographic entry see Field 5C.
W77-07464

EFFECT OF NUTRIENT ENRICHMENT ON THE HETEROTROPHIC UPTAKE OF ORGANIC SOLUTES BY MICROORGANISMS,
For primary bibliographic entry see Field 5C.
W77-07466

SEASONAL VARIATION IN SEDIMENT-WATER EXCHANGE OF NUTRIENT IONS IN LAKE ESROM,
For primary bibliographic entry see Field 5C.
W77-07467

AN ORGANIC CARBON BUDGET FOR AN OLIGOTROPHIC LAKE IN NEW HAMPSHIRE, U.S.A.,
For primary bibliographic entry see Field 5C.
W77-07470

POST-GLACIAL HISTORY OF MIRROR LAKE AND ITS WATERSHED IN NEW HAMPSHIRE, U.S.A.: AN INITIAL REPORT,
For primary bibliographic entry see Field 5C.
W77-07472

MAJOR AQUIFERS IN DEUEL AND HAMLIN COUNTIES, SOUTH DAKOTA,
Geological Survey, Vermillion, S. Dak. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07483

REAERATION-COEFFICIENT MEASUREMENTS OF 10 SMALL STREAMS IN WISCONSIN USING RADIOACTIVE TRACERS--WITH A SECTION ON THE ENERGY-DISSIPATION MODEL.
Geological Survey, Madison, Wis. Water Resources Div.
R. S. Grant.
Available from the National Technical Information Service, Springfield, VA as PB-265 296/As, Price codes: A04 in Paper copy, A01 in microfiche. Water-Resources Investigations 76-96, October 1976. 50 p, 29 fig, 13 tab, 8 ref.

Descriptors: *Reaeration, *Streams, *Water pollution, *Tracers, *Radioactivity techniques, Methodology, Dissolved oxygen, Streamflow, Flow rates, Water temperature, Water pollution control, Forecasting, *Wisconsin, *Pollutant identification.

Reaeration-rate coefficients were measured for 10 small streams in Wisconsin using the radioactive-tracer method. The coefficients ranged from 2.06 to 55.2 per day (base e at 25 degrees Celsius). Stream discharges ranged from 0.3 to 37.0 cubic feet per second, most discharges being less than 10 cubic feet per second. Data also were collected for evaluation of the energy-dissipation model. The escape coefficient of 0.090 per foot at 25 degrees Celsius may be used for small streams similar to those studied. (Woodward-USGS).
W77-07496

AN INVESTIGATION OF COLLOIDAL ORGANIC PARTICLES ISOLATED FROM DIFFERENT POPULATIONS OF BIVALVES,
W. T. Lammers.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1540-1545, 1975. 4 fig., 1 tab., 13 ref.

Descriptors: *Analytical techniques, *Mollusks, *Colloids, *Tripton, Viruses, *North Carolina, Freshwater, Saline water, Density, Organic matter, *Salt marshes.
Identifiers: *Nucleic acids.

The low number of particles per unit volume make it difficult to obtain a sufficient number of organic coloids in natural water for analysis of virus and virus-like particles. This investigation attempted to determine whether detectable numbers of organic colloids are accumulated by bivalves, to characterize the particles, and to compare qualitative and quantitative changes in organic colloids from fresh and salt water. The colloids were extracted from bivalves collected from fresh water and saline marsh sites at different levels of pollution in North Carolina. The fresh water bivalves were Anodonta cataracta and Elliptio lanceolata; the lowest salinity bivalve was Polymesoda caroliniana; the mid-marsh animal was Modiolus demissus, and the outer marsh bivalve was Crassostrea virginica. Nucleic acid determinations were made of each sample before density gradient centrifugation and of selected particle bands afterwards by using the acridine orange fluorescent technique. The stained slides were viewed with a UV microscope using dark field and filtered to pass wavelengths between 460 and 530 nm. The results were quantified by measuring fluorescence and are expressed in microamps of fluorescence in a table. The virus-like particles fall into a group well separated from other known particles by density, sedimentation coefficient, and the presence of nucleic acid. Consequently relatively small colloids and virus-like particles. (Auen-Wisconsin).
W77-07498

SIMILARITIES AND DIFFERENCES IN THE CHEMICAL COMPOSITION OF WATERS FROM WEST, CENTRAL, AND EAST AFRICA,
S. A. Visser, and J. P. Villeneuve.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1416-1425, 1975. 4 tab., 51 ref.

Descriptors: Chemical properties, *Lakes, *Rivers, *Africa, Specific conductivity, *Statistical methods, Hydrogen ion concentration, Cations, Anions, Sodium, Potassium, Ammonia, Iron, Aluminum, Chlorides, Fluorides, Calcium, Magnesium, Manganese, Chlorine, Nitrates, Nitrites, Silica, Sulfates, Phosphates, Data collections, *Pollutant identification.
Identifiers: West Africa, East Africa, Central Africa, *Ranking methodologies.

Comparisons are made of data on specific conductivity, hydrogen ion concentration, cations and anions of 22 lakes and rivers in West Africa, 9 Central African lakes and rivers, and 21 East African lakes and rivers. The data is based on 520 samples collected from over 150 sites, and from earlier studies. The number of times, expressed on a percentage basis, that one of the 108 parameters had a 99% significant correlation with any other parameter, is tabulated for each region. Because of the large number of highly significant correlations those with the highest listed numerical value indicate water quality of a specific area, and can serve in the selection of useful chemical or physical indicators of water quality in the respective area. The chemical measurements, in ppm, are given for sodium, potassium, ammonia, calcium, magnesium manganese, iron, aluminum, chlorine, fluoride, nitrate, nitrite, silica, sulfate, and phosphates. (Auen-Wisconsin)
W77-07510

CALCULATION OF CALCIUM CARBONATE-CARBON DIOXIDE EQUILIBRIUM IN WATER AND MIXTURES OF WATER,
A. Lindberg, and C. Borno.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1511-1517, 1975. 5 fig., 1 tab., 14 ref.

Descriptors: *Computer programs, *Calcium carbonate, *Carbon dioxide, *Equilibrium, Measurement, Methodology, Equations, Analytical techniques, *Pollutant identification.

A preliminary computer program is outlined which is used for approximate calculations of calcium carbonate-carbon dioxide equilibrium relations in natural waters and mixtures of waters. The program also permits the calculation of equilibrium alternations when the pH value of the water is changed by the addition of acid or alkali or when the water is heated in a heat exchanger, etc. The program is in the process of development thus its details are incomplete. The development work is carried out on an HP calculator 9100 B with an extended memory 9101 A. A flow chart and equations illustrate the calculation principle. The data required are the pH value, specific conductance, temperature and the concentrations of bicarbonate, bicarbonate anions and calcium, calcium ions in the water. (Auen-Wisconsin)
W77-07513

SATELLITE OBSERVATIONS OF WATER QUALITY,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
G. P. Harris, R. P. Bukata, and J. E. Bruton.
Transportation Engineering Journal of ASCE, Proceedings of the American Society of Civil Engineers, Vol. 102, No. TE3, Proceedings paper No. 12300, p 537-554, August 1976. 16 fig, 28 ref.

Descriptors: *Water quality, Hydrography, *Biomass, *Suspended solids, Limnology, *Remote sensing, *Lake Ontario, Turbidity, *Chlorophyll, Sampling, Equations, *Pollutant identification, Data collections.
Identifiers: *Pattern recognition, Radiance data, *Landsat-1 data.

LANDSAT-1 observations of water quality indicate that hydrography, suspended solids, and chlorophyll a can be measured with MSS bands 4, 5, and 6, respectively. As a summary of both published and unpublished work performed at CCIW and McMaster University in the pattern recognition studies of the LANDSAT-1 digital data collected over the Laurentian Great Lakes, results are reviewed of the physical interpretations ascribed to data of the pattern observed in various combinations of the radiance bands while absent in others. Band-by-band limnological interpretations of the patterns observed in the digital printouts of the LANDSAT-1 apparent radiance data are given. (Bell-Cornell)
W77-07554

LIMITATIONS OF SINGLE WATER SAMPLES IN REPRESENTING MEAN WATER QUALITY 1. THOMPSON RIVER AT SHAW SPRING, BRITISH COLUMBIA,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
E. Oguss, and W. E. Erlebach.
Technical Bulletin No. 95, 1976, 22 p., 3 fig., 1 tab, 6 ref., 2 append.

Descriptors: *Water sampling, *Sampling, Average, Limiting factors, Spatial distribution, Monitoring, Water analysis, *Pollutant identification, *Canada, Water quality, Phosphorus, Nitrates, Nitrites, Iron, Fluoride, Lead, Zinc, Silica, Hydrogen ion concentration.
Identifiers: Errors, *Thompson River(BC), Shaw Spring, *British Columbia, Single water sampling, Spences Bridge Station, Nicola River.

This study was undertaken to determine the degree to which infrequent single grab samples are representative of the monthly or quarterly mean water quality of the Thompson River in the vicinity of the station at Spences Bridge. The study was designed to determine the magnitude of spatial and temporal variability in the concentrations of the following parameters: total phosphorus, nitrate plus nitrite, iron, fluoride, lead, zinc, silica and pH. These parameters were selected because they had shown marked variation in previous quarterly sampling. The results illustrate the uncertainities associated with single grab samples as indicators of quarterly mean concentrations. For example, if a single sample has a total phosphorus concentration of 0.054 mg/1, one can conclude with 95 percent confidence that the true instantaneous mean value is between 0.040 mg/1 and 0.068 mg/1 and that the true quarterly mean value is between 0.0 mg/1 and 0.127 mg/1. Furthermore, the need for caution in inferring the presence of a trend on the basis of single samples taken quarterly is apparent. The use of quarterly sampling data as a means of flagging water quality impairment or measuring trends must include a consideration of both alpha and beta errors. Errors associated with getting a high single sample when the mean concentration is in fact low (alpha error or false positive) and errors associated with getting a low single sample when the mean concentration is in fact high (beta error or false negative) could lead to erroneous conclusions. Improvements in analytical technique and sample handling cannot increase the precision with which a single sample measurement represents mean instantaneous, temporal or spatial concentrationss. (WATDOC)
W77-07563

THE CHANGES IN INORGANIC NITROGEN CONCENTRATION OF DRINKING WATER FROM WELLS OVER A TWO YEAR PERIOD IN ANI-MACHI, IBARAKI PREFECTURE, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.

For primary bibliographic entry see Field 5B.
W77-07570

IMPROVED METHOD FOR THE DETERMINATION OF ATP IN LAKEWATER, (IN GERMAN),
Eidgenoessische Anstalt Fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
L. Hofer-Siegrist.
Schweiz Z Hydrol 38(1), p 49-54,1976.

Descriptors: Pollutant identification, *Sampling, Lakes, Analytical techniques, Methodology.
Identifiers: *ATP.

An improved method for the derermi tion of ATP in lakewater is described. The process can be usefully applied in limnolog cal routine analyses by deep freezing filter residue samples in liquid N, which can then be transported to the laboratory. Possible sampling and processed errors are discussed. --Copyright 1977, Biological Abstracts, Inc.
W77-07578

HEAVY METALS (FE, MN, CD, CR, CU, PB AND ZN) IN THE PELAGIC ZONE OF LAKE CONSTANCE (OBERSEE AND UNTERSEE) AND THE GREIFENSEE, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
H. R. Hegi.
Schweiz Z Hydrol 38(1), p 35-47, 1976.

Descriptors: *Heavy metals, Iron, Copper, Cadmium, Lead, Chromium, Manganese, *Spectrophotometry, Analytical techniques, Zinc, *Pollutant identification, Lakes.
Identifiers: *Lake Constance(Switzerland), *Atomic absorption spectrometry, *Greifensee(Switzerland), Pelagic zone(Lakes).

Monthly measurements were made over a 1 yr period to determine the heavy metals Fe, Mn, Cd, Cr, Cu, Pb and Zn in the vertical profiles of Lake Constance (Obersee and Untersee) and Greifensee, by means of atomic absorption spectrometry. Fe and Mn exhibited the usual cyclical fluctuations depending on redox conditions in the hypolimnion. For Cd, Cr, Cu, Pb and Zn no concentration patterns were noted that would show their dependency on seasonal and vertical stratifications.--Copyright 1977, Biological Abstracts, Inc.
W77-07580

A COMPARISON OF SPECTROPHOTOMETRIC METHODS FOR THE DETERMINATION OF PHYTOPLANKTON PIGMENTS, (IN FRENCH),
Biological Station, Besse-en-Chandesse (France).
G. Millerioux.
Ann Stn Biol Besse-En-Chandesse 9, p 59-78, 1974.

Descriptors: *Spectrophotometry, *Phytoplankton, *Pollutant identification, Pigments, *Plant pigments, Sampling, Analytical techniques, Lakes, Methodology.
Identifiers: Lake d'Aydat(France).

The size of the sample to be filtered is a function of the density of the phytoplankton and in Lake d'Aydat (France) a sample of between 1-2 l was needed. Best results were obtained when the magnesium carbonate concentration was adjusted to a constant figure. Whatman glass fiber filters are recommended as giving the best results. Acetone (90%) is the best solvent. It is recommended that samples be treated as quickly as possible after taking; samples left more than a few days do not give consistent results.--Copyright 1977, Biological Abstracts, Inc.
W77-07581

DATA 1973/1974 REGARDING HYDROGRAPHY AND WATER QUALITY IN THE WESER ESTUARY, GERMANY, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W77-07584

BACTERIOLOGICAL AND COLIMETRIC EXAMINATION OF THE WATER SUPPLIED TO THE SLAUGHTERHOUSES SITUATED NEAR SALVADOR, BAHIA, BRAZIL, (IN PORTUGESE),
Bahia Univ., Salvador (Brazil). School of Veterinary Medicine.
E. N. Teixeira, and C. A. Cordeiro.
Bol Inst Biol Bahia 14(1), p 129-133, 1975.

Descriptors: *Aerobic bacteria, *Coliforms, Sampling, Water quality standards, South America, Water pollution, *Bacteriology, *Pollutant identification.
Identifiers: *Colimetric examinations, Slaughterhouses(Wastes), *Salvador(Brazil).

A survey was done to determine the number of viable aerobic bacteria and coliform density from water used in 5 slaughterhouses near Salvador, Bahia, Brazil. Only 11 of 250 samples analyed were within bacterimetric and colimetric standards adopted in Brazil. The average bacterimetry was 3105.45 plus or minus 250.05 and the average colimetry was 1766.65 for 1 ml and 100 ml, respectively.--Copyright 1977, Biological Abstracts, Inc.
W77-07587

STUDY OF BACTERIAL CONTAMINATION IN THE PORT MAHON HARBOR: EFFECT OF ECOLOGICAL CONDITIONS OF THE HARBOR, (IN SPANISH),
Instituto Espanol de Oceanografia, Palma de Mallorca (Spain). Coastal Lab.
B. Payeras Cifre.
Bol Inst Esp Oceanogr 203-204, p 1-24, 1975.

Descriptors: Bacteria, Water pollution, Ecology, Coliforms E. coli, Harbors, Streptococci, Phytoplankton, Dissolved oxygen, Sampling, Pollutant identification.
Identifiers: Heterotrophic(Activity), Port Mahon Harbor(Spain).

Analysis of water samples taken in April showed that Escherichia coli, Streptococcus faecalis and coliform contamination from urban wastes was highest at stations near the interior of the Port Mahon harbor (Spain). Dissolved O2 was highest at the interior mainly because of the presence of abundant phytoplankton in the springtime. Fecal contamination indices were established for the different sampling stations and the relation between fecal contaminations and heterotrophic activity were discussed. The construction of an underwater pipeline to deposit residual waters into deeper waters and improve ecologic conditions was proposed.--Copyright 1977, Biological Abstracts, Inc.
W77-07588

BACTERIOLOGIC ANALYSIS IN THE AROSA, VIGO AND PONTEVEDRA ESTUARIES, (IN SPANISH),
G. De Santiago Fierro, I. G. De La Banda, and J. M. Masso.
Bol Inst Esp Oceanogr 205, p 5-13, 1976.

Descriptors: *Bacteria, *Bacteriology, *Estuaries, Sampling, *Mollusks, *Sediments, Public health, Estuaries, Pollutant identification.
Identifiers: Arosa estuary(Spain).

Water samples collected with gauze traps, sediment and mollusks from these 3 (Spanish) inlets were subjected to a series of diagnostic tests to determine the presence of pathogenic Vibrio spp. Samples were taken near sewage outlets of local population centers and incubated on thiosulfate citrate bile salts agar. Data on colony identification and biochemical reactions were given. The results showed the absence of any pathogenic Vibrio spp.--Copyright 1977, Biological Abstracts, Inc.
W77-07589

ASSAY OF DETERGENT RESIDUES IN FRESH WATER, SEA WATER AND WASTE WATERS: METHOD OF EXTRACTION AND CONCENTRATION OF SURFACTANTS BY ADSORPTION ON LIQUID-LIQUID INTERFACE, (IN FRENCH),
Tours Univ. (France). Laboratoire de Chimie Minerale et d'Hydrologie.
F. Clanet, and J.-F. Viller.
Water Research 10(9), p 829-832, 1976.

Descriptors: Assay, *Detergents, *Surfactants, *Separation techniques, Adsorption, Interfaces, *Pollutant identification, *Oil wastes, Liquids, Sea water, *Oil pollution, Freshwater.
Identifiers: *Colorimetry, Liquid-liquid interfaces.

The surfactant adsorption properties on greases and oils are used for extraction and concentration of surfactans from waters and wastes. The recovery rate is 97 1% with vaseline oil in the conditions exposed. On this oil, surfactants may form colored complexes with ligands allowing direct colorimetric determinations. Different techniques are developed.--Copyright 1977, Biological Abstracts, Inc.
W77-07591

5B. Sources Of Pollution

INTERACTIONS OF CUPRIC ION WITH HUMIC ACID,
Missouri Univ. Columbia. Dept. of Chemistry.
J. B. Green.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 338, Price codes: A11 in paper copy, A01 in microfiche. M.A. Thesis, (1975). 225 p, 16 fig, 25 tab, 76 ref. OWRT B-115-MO(1), 14-34-0001-6095.

Descriptors: *Humic acids, Coal, Copper, Ions, *Leaching, Heavy metals, Neutralization, Coal mines, Chelates, Acids, Waste water treatment.
Identifiers: *Coal humic acids, *Cupric ion.

The properties of coal humic acids were examined with the objective of determining their suitability for removing some of the major pollutants associated with the mining and use of coal. The preparation and characterization of coal humic acids is described. Their acid-base and precipitation behavior were determined. Rates and equilibria for leaching of copper from insoluble copper salts by coal humicacids were measured. The formation constants of soluble copper humate chelates were measured. Binding of copper by insoluble coal humic acids in acidic media was investigated. Even at pH values as low as 2, copper is bound to insoluble coal humic acid in water.
W77-07104

THE EFFECT OF THE USE OF PESTICIDES AND FERTILIZERS IN THE WATER PROTECTION ZONE WITH SOURCES OF ARTIFICIAL REPLENISHMENT OF UNDERGROUND WATER RESERVES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
G. M. Pakhov, R. V. Petrov, V. V. Tsapko, and L. N. Vanyurikhina.
Gig Sanit 3, p 101-102, 1976.

Descriptors: Water pollution sources, *Insecticides, *Fertilizers, Agricultural runoff, *Path of pollutants, DDT, *Pesticide residues, Soil analysis.

Identifiers: *USSR(Severskii Donets river valley), Atrazine, Mataphor, Granosan.

Tests were conducted in the water protection zone of the Severskii Donet river valley (USSR) to determine the possible pollution by insecticides and fertilizers of run off waters from farmlands entering underground streams feeding several intakes. Soil probes indicated that metaphos, DDT, granosan and atrazine remained in the upper layer of the soil and did not penetrate down to the water table. Hexachlorocyclohexane was found in surface and river waters of the intakes indicating penetration was possibly due to physical and chemical composition of the soil, amount of rainfall, geological relief, height of the water table or hydraulic connection of the Upper Cretaceous water-bearing horizon with the polluted waters of the Severskii Donets and its tributaries. Comparative data over a 10-yr period showed in increase (300-400%) in dry residues, chlorides (500%), sulfates (700-800%) and acidity (150%) in the intakes due to use of mineral fertilizers.--Copyright 1977, Biological Abstracts, Inc.
W77-07107

NITRATE IN GROUND WATER AND ITS RELATION TO FERTILIZATION, (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
J. Borneff, and B. Adade.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 157(4), p 337-355, 1973.

Descriptors: *Nitrates, *Groundwater, *Fertilization, Potable water, Water treatment, *Waste water treatment, Water wells, Water pollution, Public health.
Identifiers: *Nitrosamines, MetHb.

A high content of NO3- in drinking water is particularly hazardous to infants because of the formation of metHb. If sufficient amounts of nitrosamines are formed and become active in the digestive tract, there is a risk of cancer to all age groups. Various prophylactic measures are required. The admission of increasing amounts of NO3- into ground water must be avoided. Techniques to decrease the amount of NO3- in drinking water and appropriate instructions on domestic food preparations must be applied. For 2 yr at 14 day intervals checks were made of 3 wells in the Mainz, West Germany, basin and the upper layers of the soil in the immediate catchment areas. The highest amount of NO3- in soil was found in the vicinity of 2 of the wells situated in a wine growing area and corresponded to the fertilization period (June and July). A minimum amount was recorded in winter. The wells carried the highest amount of NO3- 6 mo. later. Amounts of NO3- in unfertilized soil of the same area followed similar principles, i.e., untreated soil also contributed NO3- to the ground water. The NO3- fluctuation in the 3rd well situated in a fruit- and vegetable-growing area was less evident, but concentrations were somewhat higher, even though the fertilization was not more intense than that in the wine growing area. The extent of vegetative cover and the porosity of the soil are decisive factors for the fertilization-dependent NO3- concentration in ground water. The leaching of naturally formed NO3- in the soil is also of considerable importance. A rigorous restriction of the use of mineral fertilizer alone cannot be successful in controlling NO3- leakage into ground water. Prophyiactic measures must be extended to cover the avoidance of overfertilization, optimal cultivation of the soil, correct of sites and good construction techniques of wells. If these measures do not lower the NO3- content of drinking water to the recommended WHO standards, the water must be treated (e.g., by means of ion exchangers biological denitrification), and where this is impossible, measures must be taken domestically (e.g., special water for infant food, etc.). NO3- standards regarding the formation of nitrosamines are not yet established.--Copyright 1974, Biological Abstracts, Inc.
W77-07112

VARIATIONS IN THE LEAD, ZINC AND CALCIUM CONTENT OF DENDROBAENA RUBIDA (OLIGOCHAETA) IN A BASE METAL MINING AREA,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-07135

THE RATE OF MICROBIAL DEGRADATION OF OIL IN A BEACH GRAVEL COLUMN,
University Coll. of North Wales, Bangor. Marine Science Labs.
C. F. Gibbs, and S. J. Davis.
Microbial Ecology, vol. 3, p. 55-64, 1976. 6 fig., 1 tab., 12 ref.

Descriptors: *Microbial degradation, *Oil, *Biodegradation, Oil pollution, Laboratory tests, Percolator, Nutrient, Requirements, Water temperature, Laboratory equipment, Microorganisms, Methodology.
Identifiers: Crude oil, Continuous flow respirometer, Nutrient supplements, Oxidation rates.

An automatic, continuous flow respirometer was used to follow the bio-oxidation of a crude oil in a column of fairly coarse beach material. A number of water percolation rates were employed, with and without inorganic nutrient supplementation (nitrate and phosphate). Initially, nutrient supplementation was required to allow significant oxidation rates, but a capacity for biodegradation in the absence of continued supplementation developed slowly. The increase in oxidation rate with nutrient supplementation was in the proportion of 0.23 mg oxygen per micromole nitrate. This proportionality was similar to previous results (using different systems), as was the effect of temperature. The mean of two Q10 values was 2.7. (Katz)
W77-07138

NITROGEN CONTAMINATION SOURCES IN SHALLOW GROUND WATER, LAS VEGAS AREA, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
J. W. Hess, and R. O. Patt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 328, Price codes: A04 in paper copy, A01 in microfiche. Technical Report Series HW-32, April 1977. 60 p, 9 fig, 8 tab, 43 ref, 2 append. OWRT B-085-NEV(1). 14-31-0001-6097.

Descriptors: *Groundwater, *Nitrates, Nitrogen, Organic soils, Water quality, Groundwater mining, Mathematical models, Chemical analysis, Soil moisture, Resistivity, *Nevada, Water pollution sources.
Identifiers: *Las Vegas Valley(Nev), *Shallow groundwater.

The problem of high nitrate concentrations in shallow ground water in the Gilcrease Ranch area of Las Vegas Valley, Nevada first became apparent in 1972 when Clark County District Health Department officials reported nitrate concentrations of up to 450mg/l in domestic wells of the area. Presently high nitrate concentrations affect at least 40 homes in a 17 km2 area. Possible sources for these high nitrate levels include nitrogen organic and/or evaporite materials. High nitrate concentrations in ground water in the area are encountered in first water at 26 to 28m depth and extend to a depth of 44m. Contamination of the better quality lower aquifer zones has apparently not yet occurred. Based on geochemical, hydrologic and volumetric evidence: (1) ammonium sulfate fertilizer used on the Gilcrease Ranch probably is not a significant source of nitrate, (2) septic systems and animal corrals leachates are not prime sources of nitrate to most wells and (3) natural nitrate producing sources are the most likely source of nitrate pollution in the study area. Homes with nitrate concentrations in well waters exceeding 45 mg/l should use uncontaminated water from other sources for drinking and culinary pruposes until either a new, properly constructed well is drilled or other water service is provided. All new wells in the area should be drilled to a depth sufficient to provide water from the lower good quality aquifers and should be sealed for at least the first 60m. (See also W76-09762)
W77-07141

ANALYSIS OF FLOW AGAINST DISPERSION IN POROUS MEDIA,
Birmingham Univ. (England), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-07150

APPLICATION OF NITROGEN-ISOTOPE STUDIES TO HYDROLOGY AND HYDROGEOLOGY--ANALYSIS OF THE PECULIAR CASE OF THE MELARCHEZ BASIN (SEINE-ET-MARNE, FRANCE) (APPLICATION DE L'ETUDE ISOTOPIQUE DE L'AZOTE EN HYDROLOGIE ET EN HYDROGEOLOGIE--ANALYSE DES RESULTATS OBTENUS SUR UN EXEMPLE PRECIS: LE BASSIN DE MELARCHEZ (SEINE-ET-MARNE, FRANCE)),
Centre National de la Recherche Scientifique, Paris (France). Laboratoire de Geologie Dynamique.
A. Mariotti, and R. Letolle.
Journal of Hydrology, Vol. 33, No. 1/2, p 157-172, March 1977. 6 fig, 2 tab, 16 ref.

Descriptors: *Water pollution sources, *Nitrates, *Watersheds(Basins), *Agricultural runoff, Agricultural watersheds, Foreign countries, Foreign research, On-site investigations, Tracers, *Path of pollutants, Nitrogen, Runoff, Farm wastes, Fertilizers, Groundwater, Surface waters, Agriculture, *Isotopic studies.
Identifiers: *France(Melarchez Basin), *Nitrogen-isotope studies.

The isotope ratio N15/N14 of nitrates were studied on a small basin near Paris, in an intensively cultivated area. The measurements were made at the basin outlet. This study allowed the distinction to be made between three potential nitrogen inputs: (1) nitrates from the local nitrogen cycle; (2) nitrates from nitrification of animal wastes; and (3) nitrates from artificial fertilizers. The isotope balance indicated that the preponderant source for nitrates was from artificial fertilizers. (Humphreys-ISWS)
W77-07154

LEACHING CHARACTERISTICS OF POLLUTED DREDGINGS,
Hayward Baker Co., Odenton, Md.
J. S. Jin, R. J. Krizek, and G. L. Roderick.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE2, Proceedings Paper 12848, p 197-215, April 1977. 2 fig, 5 tab, 11 ref. EPA 15070-GCK, R-800948.

Descriptors: Leaching, *Dredging, Water pollution, *Permeability, *Water pollution sources, Additives, Channel improvement, Soil amendments, Desilting, Leachate, Soil water, Groundwater, Subsurface drainage, Properties, Infiltration, Chemical analysis, Pollutants, Sedimentation, Waste disposal, Wastes, Landfills, Trace elements, Bottom sediments.
Identifiers: *Leaching characteristics, *Dredges, *Disposal sites, *Spoil, *Great Lakes harbors, Chemical constituents, Chemical additives.

This study was directed toward evaluating the pollution potential of leachates from seven different dredged materials and the effect of various additives on improving leachate quality, as well as sedimentation characteristics and shear strength. Based on the results of sequential series of sedimentation tests and sedimentation-leaching tests with and without additives, no significant changes in leachate quality were observed; increases in the specific ion concentrations and increases in the dissolved solids of the leachates were directly attributable to the additives used. In most cases there were increases in the solids due to flocculation, and lime was found to be effective in stabilizing the soil structure, increasing the permeability of the sediment and hastening the rate of leachate production. In an effort to assess the long-term pollution potential of such leachates with and without addition of lime, a series of repeated leaching tests were performed. The leachates from the dredged materials tested do not appear to cause any serious pollution problem. (Henley-ISWS)
W77-07158

STOCHASTIC PROPERTIES OF DAILY TEMPERATURE IN RIVERS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
C. C. S. Song, and C-Y. Chien.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE2, Proceedings Paper 12858, p 217-231, April 1977. 6 fig, 5 tab, 9 ref, 1 append. NSF ENG 74-02036.

Descriptors: *Water temperature, *Rivers, *Regression analysis, Air temperature, Correlation analysis, *Stochastic processes, Temperature, Thermal pollution, Freezing, Probability, Model studies, Mathematical models, Statistical methods, Statistics.
Identifiers: Stochastic models, Probability theory.

Some stochastic properties of the daily range of water temperature variations in rivers, mostly located in the central part of the United States, were analyzed using data published by the U.S. Geological Survey. It was found that the water temperature variation follows quite closely the patterns of air temperature variation when the river is not subjected to freezing. Freezing tends to inhibit the water temperature variation, and the degree of daily temperature variation diminishes as the daily mean temperature approaches 0 C. As a result, the daily range of water temperature variation of a freezing river is highly correlated with daily mean water temperature. Some aspects of auto-regression and cross-regression models were reviewed and applied. An air-water temperature response coefficient was found to correlate well with a dimensionless number representing the ratio of the characteristic period of air temperature variation and the characteristic time scale of heat transfer in a river. (Sims-ISWS)
W77-07159

CONVECTIVE-DISPERSION IN PERENNIAL STREAMS,
Sargent and Lundy, Chicago, Ill.
A. Prakash.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE2, Proceedings Paper 12891, p 321-340, April 1977. 11 fig, 4 tab, 25 ref, 1 append.

Descriptors: *Convection, *Dispersion, *Water pollution sources, *Streams, Rivers, Radioactive waste disposal, Model studies, Mathematical models, Pollution, Streamflow, Channels, Mixing, Effluents, Analytical techniques, *Path of pollutants.
Identifiers: Method of images, Nonpoint sources of pollution.

Mathematical models were developed to predict the spatial distribution of concentration of radioactive effluents discharged into a perennial stream. The models include continuous, instantaneous, and finite time release of effluents from point, line, plane, and parallelepiped sources. Analytical solutions were presented for both steady-and nonsteady-state transports of effluents. The effect of finite channel dimensions was taken care of by the method of images. The sensitivity of the mixing process to the variations in the coefficients of transverse and in the vertical dispersion was illustrated by numerical examples. The practical application of each solution was demonstrated by solving specific field problems. (Sims-ISWS)
W77-07160

FAR FIELD CIRCULATION VELOCITIES IN SHALLOW LAKES,
North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W77-07164

RED TIDE IN THE UPWELLING REGION OF BAJA CALIFORNIA,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
For primary bibliographic entry see Field 5C.
W77-07169

NONPOINT SOURCE EFFECTS ON WATER QUALITY,
Florida Technological Univ., Orlando.
M. P. Wanielista, Y. A. Yousef, and W. M. McLellon.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p 441-451, March 1977. 5 fig, 10 tab, 24 ref.

Descriptors: *Water quality standards, *Water pollution sources, Pollutants, *Florida, Urban runoff, Agricultural runoff, Land use, Precipitation(Atmospheric), Wastes, Chemicals, Heavy metals, Pesticides, Fertilizers, Instrumentation, Data collections, Lakes, Streams, Watersheds(Basins), Water pollution, *Standards, *Path of pollutants.
Identifiers: *Nonpoint sources of pollution, Mass loading, Loading rates, Mass standards.

Results of a project to define the nature and extent of nonpoint source water quality responses were reported. Included were some details of a procedure to construct instrumentation that can automatically collect water samples in a way that reflects field conditions, water quality response curves related to point and nonpoint sources, and development of loading rates from nonpoint sources for urban and non-urban basins. A pollutant mass standard was proposed where appropriate, in addition to concentration standards. The work is useful as an aid to establish field measuring programs to determine the characteristics and extent of nonpoint and point source pollution. Results for two basins in central Florida were presented. A comarison of these results considered with other data indicated the necessity of site-specific studies. (Sims-ISWS)
W77-07173

DISSOLVED HELIUM IN LAKES: URANIUM PROSPECTING IN THE PRECAMBRIAN TERRAIN OF CENTRAL LABRADOR,
McMaster Univ., Hamilton (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 5A.
W77-07174

TRANSPORTS IN LAKE SUPERIOR,
Minnesota Univ., Duluth. Dept. of Physics.
S. Diehl, W. Maanum, T. Jordan, and M. Sydor.
Journal of Geophysical Research, Vol. 82, No. 6, p 977-978, February 20, 1977. 5 fig, 7 ref. NASA NGL 24-005-263, EPA R005175-02.

Descriptors: *Sediment transport, *Winds, *Lake Superior, *Model studies, *Great Lakes, Mathematical models, Circulation, Water circulation, Suspended solid, Lakes, Satellites(Artificial), Remote sensing, Turbidity, Pollutants, *Path of pollutants, Water pollution, Limnology.
Identifiers: LANDSAT, Taconite tailings.

Transports for Lake Superior were obtained by using a depth-integrated model applied to a 6 x 6 km grid. The results were used to explain the movement of red clay plumes in extreme western Lake Superior. For northeasterly winds, the calculated transports and LANDSAT data on turbidity show that the plumes originating along the Wisconsin shore move toward Minnesota Point and are then taken out along the axis of the arm of the lake because of a return path produced by currents along the Minnesota and Wisconsin shores converging at Minnesota Point. The results from the model also account for the migration of taconite tailings along the Minnesota shore from Silver Bay to the Duluth water intake. (Sims-ISWS)
W77-07176

THE ECOLOGICAL CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART I: ECOLOGICAL STUDIES,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 5C.
W77-07178

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART II. CHEMICAL STUDIES,
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07179

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART III: HISTOPATHOLOGICAL STUDIES,
National Water Quality Lab., West Kingston, R. I.
For primary bibliographic entry see Field 5C.
W77-07180

RAPID DETERMINATION OF TOTAL ORGANIC CARBON AND ITS APPLICATION TO WATER RESEARCH, (IN JAPANESE),
Osaka City Inst. of Public Health and Environmental Sciences, (Japan).
For primary bibliographic entry see Field 5A.
W77-07183

THE DISTRIBUTION AND ECOLOGY OF COMMON MARINE AND ESTUARINE GASTROPODS IN THE DELAWARE BAY AREA,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W77-07185

HEAVY METAL POLLUTION IN TRONDHEIMSFJORDEN, NORWAY, AND THE RECORDED EFFECTS ON THE FAUNA AND FLORA,
Kongelige Norske Videnskabers Selskab, Trondheim. Museet.
For primary bibliographic entry see Field 5C.
W77-07194

UPTAKE, DISTRIBUTION, AND DEPURATION OF 14C-BENZENE IN NORTHERN ANCHOVY,

ENGRAULIS MORDAX, AND STRIPED BASS, MORONE SAXATILIS,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
For primary bibliographic entry see Field 5C.
W77-07202

ENVIRONMENTAL DEPENDENCE OF MANGANESE AND ZINC IN THE SCALES OF ATLANTIC SALMON, SALMO SALAR (L) AND BROWN TROUT, SALMO TRUTTA (L),
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-07203

WATER QUALITY AND CHEMICAL MODELS,
Harvard Univ., Boston, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 5C.
W77-07246

ENTEROVIRUS AND BACTERIOPHAGE INACTIVATION IN SUBSURFACE WATERS AND TRANSLOCATION IN SOIL,
New Mexico State Univ., University Park. Dept. of Biology.
J. G. Yeager, and R. T. O'Brien.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 708, Price codes: A04 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 083, Partial Completion Report, January 1977, 40 p, 2 fig., 5 tab, 45 ref. OWRT A-052-NMEX(4). 14-34-0001-7066.

Descriptors: Microorganisms, Water pollution, *Viruses, *Bacteriophage, Investigations, *New Mexico, Subsurface waters, Surface waters, Septic tanks, *Translocation, Environmental sanitation, Human pathology, Public health, Soils, *Path of pollutants, Groundwater.
Identifiers: Inactivation, Rio Grande River(N Mex), Soil adsorption-elution, *Poliovirus 1, *Coxsackievirus B-1, *Enterovirus.

Inactivation of poliovirus 1, coxsackievirus B-1 and bacteriophages was studied in surface and subsurface waters and in septic tank liquor. In situ experiments were conducted in Rio Grande River water and in shallow ground water using dialysis membrane chambers with sidewalls. Laboratory inactivation studies were performed using deep Groundwater and septic tank liquor. Soil adsorption-elution characteristics of the viruses and bacteriophages were studied using the surface and subsurface waters as eluents. Results showed that the viruses and bacteriophages were inactivated at different rates in the waters tested. The rate of inactivation varied with virus and bacteriophage type and with water type. Extended survival of poliovirus 1 and coxsackievirus B-1 was demonstrated in shallow groundwater and septic tank liquor when compared to survival in deep groundwater. Inactivation of bacteriophages was generally faster than the viruses, and statistical comparison of inactivation rates showed that none of the bacteriophages studied would serve as suitable general indicators of enteric virus inactivation in the waters tested. Soil adsorption-elution studies showed that virus adsorption characteristics varied with virus, water, and soil type. The elution of the enteric viruses from soils was more efficient with septic tank liquor and deep groundwater. The results suggest that a health hazard could exist if pathogenic, enteric viruses were introduced into surface and groundwaters which are destined for domestic or other uses. The results also show that it is impossible to make valid generalizations regarding virus soil adsorption characteristics based on studies using only one virus, soil, or water type. (Stockton-NMex State)
W77-07283

GEOLOGISTS CLAIM HEALTH CAN BE TRACED TO ROCKS,
News in Engineering, Ohio State University, Columbus, Vol. 49, No. 1, p 10, 24, January, 1977.

Descriptors: *Human diseases, *Rock properties, *Diseases, *Environmental effects, *Soil chemical properties, *Weathering, Hardness(Water), Magnesium, Trace elements, Zinc, Fluorides, Public health.
Identifiers: Cancer, Bone disease, Selenium.

Statistics show that throughout the world, lifespan and disease patterns differ significantly between various geographical areas. New evidence suggests that some of this variance may be due to the rocks and soils of given areas, according to faculty members of the Ohio State University Geology Department. Correlations between level of iodine and goiter, fluoride and tooth decay, and high zinc concentrations and bone disease are among the most obvious to date. There are also statistical sugestions that human death rate is higher in areas with a deficiency of weatherable materials in the soil, and that cardiovascular disease is more prevalent in areas with soft water. Various types of cancer may also have geographical influences. These latter correlations remain very inconclusive, however, and much more research with attention to intervening variables is necessary before causal relationships can be inferred.(Eberle-NWWA)
W77-07290

ATOMIC ABSORPTION MEASUREMENTS OF LEAD, CADMIUM, COPPER, IRON, AND ZINC IN SESTON OF THE BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5A.
W77-07309

PRELIMINARY EXPERIMENT OF COBALT 60 POLLUTION OF A MARINE FOOD CHAIN: RESULTS OF A SINGLE INGESTION,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Departement de Protectione; CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Service de Recherches Toxicologiques et Ecologiques; and CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Laboritorie de Radioecologie Continental.
For primary bibliographic entry see Field 5C.
W77-07317

CIRCULATION AND SURGE MODELING IN PAMLICO SOUND, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-07320

LONG ISLAND BEACH POLLUTION: JUNE 1976,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program.
MESA Special Report, February 1977. 85 p, 24 fig, 11 tab, 38 ref, 2 append.

Descriptors: *Water pollution sources, *Flotsam, Pollutants, *Pollutant identification, Beaches, Winds, Wastes, Path of pollutants, New York.
Identifiers: *New York Bight, *Long Island, Floatable wastes.

Information is given on the nature and possible sources of floating trash and pollutants that were washed up in large quantities on most of Long Island's beaches during June 1976. The general orientation is defined and the roles played by the Federal, State and local agencies during the beach pollution event are described. The waste materials identified on the beaches are described; they include tar and grease balls, sewage-related items, garbage, trash, and charred wood. Historical surface wind data and the wind conditions during June 1976 were analyzed, surface drifter studies were examined and the U. S. Coast Guard and the Brookhaven National Laboratory surface transport models were applied to the events of June 1976. It was concluded that persistent southerly wind-driven transport was responsible for the stranding of the floatables. Southerly surface winds with about 8.0-kn velocities are not unusual for June over the Bight. The Hudson/Raritan estuarine outflow is a major source of floatables to the waters of the New York Bight. It also suggested that sewage sludge dumping has been a minor contributor to the floatables found on the beaches. It is understood that effective corrective measures cannot take place until quantitative documentation of the sources of floatables has been accomplished. (NOAA)
W77-07325

THE EFFECT OF COLLECTOR DISCHARGE WATER FROM RICE FIELDS ON THE ZOOPLANKTON OF SOME KUBAN ESTUARIES, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5C.
W77-07331

PROCEEDINGS OF THE SEVENTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
For primary bibliographic entry see Field 8D.
W77-07342

EFFECTS OF MAN'S ACTIVITIES ON GROUNDWATER QUALITY,
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
G. Matthess.
Hydrological Sciences Bulletin, Vol 21, No 4, p 617-628, December 1976. 97 ref.

Descriptors: *Groundwater, *Water pollution sources, *Pollutants, Infiltration, Groundwater movement, Path of pollutants, Water quality, Water pollution, Geochemistry, Biochemistry, Fertilizers, Agricultural chemicals, Solid wastes, Leaching, Pesticides, Salts, Geology, Pollution.

The changes in groundwater quality that result from man's activities were reveiwed. This paper considered the various geochemical reactions, the biochemical processes, and the physical processes that take place as well as the sources of pollution. Suggestion were made for future research, and practical guidance was given for avoidance of pollution of groundwater or for minimizing its effects. (Sims-ISWS)
W77-07359

ANTHROPOGENICALLY REDUCED GROUNDWATERS,
Coblenz Federal Inst. of Hydrology (West Germany).
F. Schwille.
Hydrological Sciences Bulletin, Vol 21, No 4, p 629-645, December 1976. 9 fig, 40 ref.

Descriptors: *Groundwater, *Dissolved oxygen, *Water pollution sources, *Reduction(Chemical), Oxygen, Geochemistry, Water pollution, Microbial degradation, Biodegradation, Biochemistry, Groundwater movement, Waste disposal, Path of pollutants, Water quality, Oxidation, Canals, Infiltration.

Groundwaters which have lost their original oxygen content as a consequence of reducing i.e., oxygen-consuming microbial processes, are a com-

mon phenomenon in nature. But man, too, can change oxygenocontaining waters in a variety of ways into oxygen-free groundwaters. The different ways of 'groundwater reduction' by man's activities were illustrated by way of selected examples. (Sims-ISWS)
W77-07360

OCCURRENCE AND DETERMINATION OF A HERBICIDE BENTHIOCARB IN RIVERS AND AGRICULTURAL DRAINAGES,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
For primary bibliographic entry see Field 5A.
W77-07361

THE ANALYSIS OF AMMONIA IN POLLUTED SEA WATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 5A.
W77-07362

PHOSPHORUS AND CARBON DISTRIBUTIONS IN A POLLUTED COASTAL ENVIRONMENT,
Lancaster Univ., Bailrigg (England). Dept. of Environmental Sciences.
S. R. Aston, and C. N. Hewitt.
Estuarine and Coastal Marine Science, Vol 5, No 2, p 243-254, March 1977. 4 fig, 3 tab, 19 ref.

Descriptors: *Phosphorus, *Carbon, *Distribution, *Coasts, *Pollution identification, Tidal waters, Sewage effluents, Intertidal areas, Particle size, Sediment distribution, Sampling, *Path of pollutants.
Identifiers: *England(Walton Backwaters), Particulates.

Phosphorus and organic carbon distributions were used to examine the effect of pollution from sewage effluents on a semi-enclosed tidal area. The phosphorus and organic carbon accumulating in the sediments of the area were related to the influx of particulate matter during tidal cycles, and some of the environmental factors determining the influence of marine effluent disposal on a coastal zone were assessed. (Visocky-ISWS)
W77-07368

INORGANIC CONTAMINANTS IN RURAL DRINKING WATERS,
South Carolina State Coll., Orangeburg. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W77-07372

STUDY ON THE HERBICIDAL PROPERTIES OF BENTHIOCARB; FACTORS AFFECTING HERBICIDAL ACTIVITY AND ITS BEHAVIOR IN SOIL, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
N. Ichizen.
Bull Coll Agric Utsunomiya Univ 9(3), p 109-125, 1976.

Descriptors: *Herbicides, *Carbamate pesticides, *Grasses, Humus, Percolation, Water temperature, Soils, Growth stages, Water pollution, Path of pollutants, Soil types, Depth.
Identifiers: Echinochloa-crus-galli-var-oryzicola, Eleocharis-acicularis, Monochoria-vaginalis, *Benthicarb.

The susceptibility of barnyard grass (Echinochloa crus-galli P. Beauv. var. oryzicola Ohwi), monochoria (Monochoria vaginalis Presl.) slender spikerush (Eleocharis acicularis Roem. et Schult.) at several growth states to Benthiocarb (S-(4-chlorobenzyl)N,N-diethyl thiolcarbamate) and the influence of soil type, temperature, water depth and water percolation on the herbicidal effectiveness of Benthiocarb against barnyard grass were determined under submerged conditions. The younger growth stages of barnyard grass, monochoria and slender spikerush were more susceptible than older growth stages. Higher herbicidal effectiveness of Benthiocarb against barnyard grass was observed in the following order: less humus-content soil > higher humus-content, soil, less water percolation > higher water percolation, higher temperature > lower temperature. The behavior of Benthiocarb in water when treated under submerged conditions as well as movement and inactivation in soil were determined using barnyard grass. Although Benthiocarb is decomposed slightly by sunlight under submerged conditions, most of it moved gradually into the soil. Benthiocarb moved downward from surface soil by leaching. The degree of movement in soil is affected by soil type and water leakage but not by temperature. The persistence of Benthiocarb in soil was nearly equal to that of CNP (p-nitrophenyl 2,4,6-trichlorophenyllether). When soil treated by Benthiocarb and thereafter inactivated was retreated with Benthiocarb, persistence was shortened. When Benthiocarb was applied to sterile and non-sterile soil, inactivation occurred sooner in non-sterile soil. Persistence in soil was affected by soil type, amount of water percolation and temperature. Decomposition products derived from Benthiocarb in soil (S-(4-chlorobenzyl)N-ethyl thiolcarbamate, p-chlorobenzoic acid) did not affect the growth of various crops at a rate of 100 g/10 ares (the standard dosage of Benthiocarb is - 200-300 g/10 ares).--Copyright 1977, Biological Abstracts, Inc.
W77-07387

MINERALIZING MICROBIAL ACTIVITY IN LAKE FARO,
Messina Univ. (Italy). Instituto di Idrobiologia.
For primary bibliographic entry see Field 5C.
W77-07418

A NITROGEN GAS (N2) MODEL FOR THE LOWER COLUMBIA RIVER, FINAL REPORT,
Water Resources Engineers, Inc., Walnut Creek, Calif.
L. A. Roesner, and W. R. Norton.
Prepared for the Portland District, North Pacific Division, U.S. Army Corps of Engineers, Portland, Oregon, Report No. 1-350, January 1971, 88 p., 2 tab., 15 fig.

Descriptors: *Columbia River, *Nitrogen, *Supersaturation, *Model studies, *Simulation, Hydraulic models, Mathematical models, Estimating, Testing, *Theoretical analysis, Salmon, Rainbow trout, Dams, Dam sites, Path of pollutants.
Identifiers: *Chinook salmon, Steelhead trout, Lower Snake River, *Control plans.

A mathematical simulation model for dissolved nitrogen in the lower Columbia and Snake Rivers is presented. The dissolved nitrogen model may serve as a valuable tool for identifying ways to control N2 levels in the river system. (Katz)
W77-07422

UPWELLING IN A MODEL OF AN INTERMONTANE LAKE,
P. F. Hamblin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 88-96, 1975. 5 fig., 5 ref.

Descriptors: *Thermocline, *Upwelling, *Model studies, *Mixing, Limnology, Hydraulic models, Wind velocity, Coriolis force, Seiches, Lake breezes, Lakes, *Canada.
Identifiers: *Babine Lake(British Columbia), *Intermontane lakes.

A two-layer linearized analytical model is presented to illustrate the response of an intermontane lake to a suddenly-imposed divergent wind field. Because of the importance of the biological processes occurring in the lake, attention is focussed primarily on the upwelling of the thermocline. Upwelling in such a model occurs not at the boundaries but in the center of the diverging wind, and over a broad central region, whereas the consequent downwelling is confined to the nearshore areas and hence is stronger. The thermocline does not have a single peak but is binodal. These features have been identified in a summer episode of upwelling in Babine Lake (British Columbia). As a consequence of the earth's rotation, the thermocline topography is rotated to the right of the wind stress in a large intermontane lake. The analytical model described is based on a two-layer inviscid equation of motion where the depth laws in the upper layer and the lower layer are elliptic in plan and parabolic in cross section. A discussion of the results of the model's application includes graphical descriptions of the displacement of the thermocline of the model lake from the initial state over four time periods, the celocity field in the upper layer as a funtion of non-dimensional time, and the same function for the lower layer. (Harris-Wisconsin)
W77-07469

A STUDY OF ENVIRONMENT SANITATION ON THE WELLS IN JUNGNEUNG-DONG AREA, SEOUL, (IN KOREAN),
Korea Univ., Seoul. Coll. of Medicine.
H. Kim, Y. J. Park, K. J. Shin, Y. H. Kim, and K. G. Kim.
Korean Cent J Med 29(1), p 51-56, 1975.

Descriptors: *Water wells, Public health, Asia, Water pollution, Water supply, *Human diseases, Potable water, *Pollutant identification, *Coliforms, *Environmental sanitation.
Identifiers: *Jungneung-Dong(Korea).

Clean water supply is an important factor in the prevention of water borne diseases in Korea and other developing countries. In Seoul, about 10% of inhabitants use untreated well water as the drinking water source. A sanitary survey was carried out on 16 pump wells, 15 lidless wells and 10 springs in the Jungneung-dong area at the foot of Mt. Puk-Ak. Potability was investigated. Average values of the water tested were pH=6.6, KMn04 consumption = 3.36 ppm, hardness of well water = 192.7 and hardness of spring water = 10.1 ppm, respectively. Quantitative analysis for ammonia-N revealed 75.6%, coliform group 73.17% and C1 demand 05.-1.0 ppm in 50% of samples. There was a significant relationship between the ammonia-N positive for coliform group bacilli and ammonia-N. --Copyright 1977, Biological Abstracts, Inc.
W77-07475

USE OF QUANTITATIVE CORRELATIONS BETWEEN MICROORGANISMS FOR RIVER POLLUTION EVALUATION, (IN RUSSIAN),
Ministerstvo Melioratsii i Vodnogo Khozyaistva, Vilnius (USSR).
Z. P. Ambrazene.
Zh Obshch Biol 37 (3); p. 416-426, 1976.

Descriptors: *Microorganisms, Water pollution, Rivers, *Correlation analysis, *Regression analysis, *Organic matter, *Classification.
Identifiers: Lithuanian-SSR, USSR, Saprobic zones.

Correlation and regression analyses of the data from field studies of water from 33 rivers in the Lithuanian SSR, USSR, revealed close relationships between individual physiological groups of microorganisms participating,in the decomposition of organic matter (correlation coefficient r = 0.5-0.9). There were also close correlations between physiological groups of microorganisms and the chemical and hydrobiological indices of the organic matter concentration in water (r = 0.4-0.8). A linear relationship was found between the microbial count and the organic matter concentration. An evaluation system for river pollution using 9 microbiological indices was devised. A classifica-

tion of water pollution in 4 grades (corresponding to 4 saprobic zones) is proposed based on quantitative relationships between individual groups of microorganisms. The proposed classification facilitates assessment of the sanitary-epidemiological condition of a water body and the degree of its pollution with organic substances. --Copyright 1977, Biological Abstracts, Inc.
W77-07482.

REAERATION-COEFFICIENT MEASUREMENTS OF 10 SMALL STREAMS IN WISCONSIN USING RADIOACTIVE TRACERS--WITH A SECTION ON THE ENERGY-DISSIPATION MODEL.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-07496

ROLE OF OLIGOCHAETES IN THE CIRCULATION OF WATER AND SOLUTES ACROSS THE MUD-WATER INTERFACE,
For primary bibliographic entry see Field 5C.
W77-07508

SOURCES OF NITROGEN AS A WATER POLLUTANT: INDUSTRIAL WASTE WATER,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
L. Landner.
Report IVL B 311, June 1976. 15 p. 8 tab., 16 ref.

Descriptors: *Nitrogen, *Industrial wastes, *Estimating, *Water pollution sources, Foreign countries, United States, California, Pulp wastes, Sulfite liquors, Industries, Metallurgy, Food processing industry, Chemical industry, Mineral industry, Fertilizers.
Identifiers: *Industrial nitrogen sources, *Sweden, Finland, Fertilizer industry.

The few estimates of nation-wide industrial nitrogen discharge sources described in the literature, particularly for Sweden, Finland, the United States, and California, are reviewed and discussed. Sources considered are pulp and paper mills; the fertilizer industry, with emphasis on their nitrogen outputs in Sweden. Detailed measurements indicate that the annual nitrogen discharges in Sweden from the pulp and paper mill industry are 4000 tons; the fertilizer industry 800 tons; the chemical industry 1700 tons; mining, iron and steel industries 2400 tons, totaling 10,400 tons annually from these industrial sources. Estimates for the chemical industry, the textile and leather industry, and the food processing industry are believed to be low, because those industrial effluents discharged to municipal sewage treatment plants are not accounted for. It is estimated that all nitrogen sources, including background, forest and agricultural runoff, and municipal and industrial wastes contribute 132,000 tons a year to Swedish waters. (Auen-Wisconsin)
W77-07521

OIL-OXIDIZING BACTERIA OF THE RIVER YENISEI, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-07532

LIMITATIONS OF SINGLE WATER SAMPLES IN REPRESENTING MEAN WATER QUALITY 1. THOMPSON RIVER AT SHAW SPRING, BRITISH COLUMBIA,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W77-07563

RELATION BETWEEN THE AMOUNTS OF FERTILIZATION AND LIVESTOCK WASTE ON FIELDS AND THE POLLUTION OF STREAMS FLOWING INTO LAKE KASUMIGAURA: 1. ON THE RELATION BETWEEN THE AMOUNT OF FERTILIZER APPLICATION AND THE SPECIFIC POLLUTION LOADS OF NITROGEN AND PHOSPHORUS IN MAIN STREAMS FLOWING INTO LAKE NISHIURA, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
S. Moriizumi, O. Kazuji, and A. Kikkawa.
Sci Rep Fac Afr-c Ibaraki Univ. 23, p 89-100, 1975.

Descriptors: *Nitrogen, *Phosphorus, *Fertilization, Fertilizers, *Water pollution sources, Agriculture, Wheat, Barley, *Farm wastes, Streams.
Identifiers: *Lake Kasumigaura basin(Japan), Lake Nishiura(Japan).

The character of agriculture in the basin of 14 streams flowing into Lake Kasumigaura and the correlation between fertilizer use per unit area of basin and the specific pollutional load of streams were investigated. The planted area of rice in the Nishiura lake basin is the largest of all crops and occupies 49.1% of total planted areas. In the upland field, the planted areas of wheat and barley are the largest of all crops, and those of wheat and barley in Ichinose stream and Kajinashi stream basin are larger than rice. The amount of fertilizer applied to paddy fields in the Nishiura lake basin contains 55.0% N and 39.0% P. Fertilizer use per basin area of 100 km2 for 1 yr in paddy crops was maximum in the Shintone stream basin and minimim in the Sanno stream basin. Its rate in upland field crops was maximum in the Ichinose stream basin. A negative correlation was found between fertilizer use per unit area of basin for rice crops and the specific pollutional load of streams. Specific pollutional load is low in the streams around which fertilizer use per unit area of basin is high. Pollutional load from paddy field apparently was less than total loads from other sources. The same results were obtained for upland field crops. (See also W77-07569)--Copyright 1977, Biological Abstracts, Inc.
W77-07568

RELATION BETWEEN THE AMOUNTS OF FERTILIZER AND LIVESTOCK WASTE ON FIELDS AND THE POLLUTION OF STREAMS FLOWING INTO LAKE KASUMIGAURA: II. ON THE RELATION BETWEEN LIVESTOCK WASTE PER UNIT AREA OF BASIN AND THE SPECIFIC LOAD OF POLLUTANTS IN MAIN STREAMS FLOWING INTO NISHIURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ. Mito (Japan). Faculty of Agriculture.
A. Kikkawa, K. Osaki, S. Moriizumi, and T. Yoshida.
Sci Rep Fac Agric Ibaraki Univ 23, p 101-106, 1975.

Descriptors: *Fertilizers, Fertilization, Water pollution sources, *Farm wastes, Cattle, *Nitrogen, *Phosphorus, Wheat, Streams.
Identifiers: Lake Kasumigaura basin(Japan), Lake Nishiura basin(Japan).

Livestock farming in the Kasumigaura lake basin and the relation between livestock head numbers per unit area basin and the specific pollutional load of streams were investigated. Cattle (30,000 head) and swine (2000,000 head) were kept in the Kasumigaura lake basin. In each stream the total head numbers of livestock were maximum in Sakura stream basin and minimum in Sanno stream basin. Livestock waste volume per unit area of basin in tabulated. The value was very large in Ichinose and Hishiki streams basin. A negative correlation was found between livestock waste volume per unit area of basin and the specific load of streams. Livestock waste effect on the specific load of streams was less than other water pollution sources. (See also W77-07568)--Copyright 1977, Biological Abstracts, Inc.
W77-07569

THE CHANGES IN INORGANIC NITROGEN CONCENTRATION OF DRINKING WATER FROM WELLS OVER A TWO YEAR PERIOD IN ANI-MACHI, IBARAKI PREFECTURE, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
K. Nagai, M. Muraoka, and M. Oida.
Sci Rep Fac Agric Ibaraki Univ 23, p 59-64, 1975.

Descriptors: *Potable water, *Nitrogen, Water wells, Water pollution sources, *Nitrates, Nitrites, Hydrogen ion concentration, Ammonium, Water supply, Pollutant identification.
Identifiers: *Ammonium nitrogen, Ani-Machi(Japan), Ibaraki prefecture(Japan).

Nitrate, nitrite, ammomium N and pH values of water drawn from 18 wells were determined about every 2 mo. for 2 yr. from June 1973 to Sept. 1975. The pH values of each sample were almost constant; 16 of the samples were about 6.0 to 6.4 and the other 2 were about 6.5 to 7.0. Nitrate concentrationas high (about 35 to 55 ppmN) in 3 adjoining wells; that of 2 adjoining changed little for 2 yr and that of the rest 35 ppm N) was fairly varied showing considerable decrease in warm seasons. Samples (14) were 10 to > 20 ppm N (5 of them about 20 to 40); only 1 was 5 ppm N. Half of the samples have constant concentrations and the other half showed reductions in Sept. or Oct. Ammonium and Nitrite were hardly ever found.--Copyright 1977, Biological Abstracts, Inc.
W77-07570

AN INVESTIGATION ON THE DISPOSAL OF PIG EXCRETA IN KASUMIGAURA AREA, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
S. Ishizaki, and H. Yahagi.
Sci Rep Fac Agric Ibaraki Univ 23, p 7-12, 1975.

Descriptors: *Farm wastes, Water pollution sources, Waste disposal, Lakes, Waste treatment.
Identifiers: *Japan(Kasumigaura area), *Pig excreta.

The excreta of pigs kept in Kasumigaura area, Japan, is a cause of water pollution in Kasumigaura lake. Transport, storage and treatment are discussed. Excreta are used mostly in farm field but are partly thrown away or permeate underground. Most pig farms have no connection with water pollution, and there is little possibility of pollution in pig farming in upland fields or those situated far from streams.--Copyright 1977, Biological Abstracts, Inc.
W77-07571

THE DISTRIBUTION OF RESIDUAL QUANTITIES OF DDT IN THE ORGANS AND TISSUES OF FISH OF THE KIEV RESERVOIR, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. R. Polishchuk, and I. N. Matvienko.
Vopr Pitan 1, p 82-83, 1976.

Descriptors: *Pesticide residues, *DDT, Reservoirs, *DDD, *DDE, Fish, Water pollution, Public health, Perch, Pike.
Identifiers: Bream, Roach, Ukrainian-SSR, Zander, *Kiev Reservoir(USSR).

Studies with fish caught in the Kiev Reservoir (Ukrainian SSR, USSR) in the spring and winter periods of 1973-1974 indicated that the content of DDT residues and its metabolites DDE and DDD was greatest in the visceral fat, somewhat less in the gonads and liver, and usually undetected in the muscle. The quantity of the residues was also af-

fected by the weight, and consequently the age of the fish. The DDT content was significantly higher in the predatory fish (pike, zander, perch) than in the nonpredatory ones (roach, beam). (The danger of contaminated food products for humans is mentioned.)--Copyright 1977, Biological Abstracts, Inc.
W77-07572

THE CILIATES OF TWO BULGARIAN TRIBUTARIES OF THE DANUBE WHICH ARE POLLUTED: THE RIVERS VIT AND OSSAM, (IN FRENCH),
Sofia Univ. (Bulgaria). Inst. of Zoology.
R. B. Detcheva.
Ann Stn Biol Besse-en-chandesse 9, p 213-218, 1974/1975.

Descriptors: *Protozoa, Water pollution, Chemical properties, Tributaries, Rivers, Europe.
Identifiers: *Bulgaria, *River Vit(Bulg), *River Ossam(Bulg).

Collections were made during spring and summer at a number of locations on each river. Of 63 spp. of ciliates found, 20 spp. were present in both rivers. The chemical parameters limiting the distribution of the species found are tabulated.--Copyright 1977, Biological Abstracts, Inc.
W77-07573

DEPOSITION OF MINERAL NITROGEN BY RAIN IN THE LAMTO SAVANNA, (IN FRENCH),
Ecole Normale Superieure, Paris (France). Laboratoire de Zoologie.
P. Villecourt.
Rev Ecol Biol Sol 12(4), p 667-680, 1975.

Descriptors: *Nitrogen, Rain, Water pollution sources, Mineralogy, Africa, *Rainfall, *Burning.
Identifiers: *Brush fires, *Ivory-Coast(Lamto Savanna), Pluviometers.

The rainfall on the Lamto Savanna (Ivory Coast) during 1972 and 1973 was collected in pluviometers. They were analyzed colorimetrically for nitric N using the Griess reaction and NH3-N using the Nessler reaction. Monthly and annual averages related to rainfall, the contents and concentrations are presented. Annual deposition of nitric N was about 2.3 kg/ha in 1972. Rainfall was 1300 mm with an average concentration of 0.18 ppm. In 1973, deposition was 1.3 kg/ha, rainfall 1250 mm, and the average concentration was 0.11 ppm. Total NH3-N determined analytically, was 6.5 kg/ha per yr; but this value is considered high. The most probable contribution should be estimated at 3 kg/ha per yr. In these depositions, it is possible to discern the result of leaching of mineral N present in the atmosphere by rain. At the beginning of the rainy season brush fires and heavy showers provide about 70% of the annual deposition of mineral N.--Copyright 1977, Biological Abstracts, Inc.
W77-07574

IN VITRO EFFECT OF ORGANIC NITROGEN AND POTASSIUM ADDITIONS ON NITROGEN MINERALIZATION AND ON EXCHANGES BETWEEN THE MUD AND WATER OF A POND, (IN FRENCH),
Lyon-1 Univ., Villeurbanne (France). Departement de Biologie Vegetale; and Lyon-1 Univ., Villeurbanne (France). Laboratoire de Biologie Animaux et d'Ecologie.
H. Beaupied.
Rev Ecol Biol Soil 12(4), p 657-666, 1975.

Descriptors: *Nitrogen, *Potassium, *Mineralogy, Muds, Ponds, Dissolved solids, *Calcium, Ureas.
Identifiers: Ammonical nitrogen.

The process of exchanges of dissolved elements between the mud and water of a pond and the mineralization of organic N, were studied in tanks in vitro. In the test lots, a migration of K and Ca from mud to water was observed. The only indication of N mineralization was an accumulation of ammonical N in mud as in water. Introduction of urea into the water resulted in a distinct increase in the ratio of K to water. Large quantities of ammoniacal N resulting from heavy mineralization may have freed K from the mud. Ca evolution was modified in comparison with the test lots. K as K2So4 added to the water was rapidly absorbed into sediment. Ca migration from mud to water was slowed down. Ammonic N accumulation was lessened. Copyright 1977, Biological Abstracts, Inc.
W77-07575

STUDIES ON THE TYPOLOGY OF BALTIC LAKES WITH DIFFERENT STATES OF EUTROPHICATION, (IN GERMAN),
D. Ventz.
Int Rev Gesamten Hydrobiol 61(2), P. 183-191, 1976.

Descriptors: *Eutrophication, Phosophorus, Cycling nutrients, Oxygen, Statistical processes, Hypolimnion, Classification, Lakes, Phosphates, Water pollution sources.
Identifiers: Typology, *Baltic lakes, Orthophosphates.

The recycling of P is considered as a process of internal eutrophication and related to the hypolimnetic 02 balance. The rate of change in orthophosphate is compared with the temperal change in 02 content by means of statistical methods. The slope and the shape of the delta P/delta O2-curves may serve as a bais for lake classification.--Copyright 1977, Biological Abstracts, Inc.
W77-07576

MODELS FOR SIMULATION OF EUTROPHICATION OF LAKES FOR LAKE CONSTANCE (BODENSEE-OBERSEE): I. DATA FROM LAKE CONSTANCE USED IN SIMULATION MODELS, (IN GERMAN),
Baden-Wuerttemberg Landesanstalt Fuer Unweltschutz (West Germany). Inst. of Seenforschungs Fischereiwesen.
For primary bibliographic entry see Field 5C.
W77-07579

STUDIES ON FUNGAL PROPAGULES IN THE WESER ESTUARY (GERMAN BIGHT): I. QUANTITATIVE DATA 1974, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W77-07583

EFFECT OF ORGANIC ACIDS ON EXPERIMENTAL MANGANESE ISOLATION FROM BOTTOM SEDIMENTS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
E. P. Nakhshina, B. I. Nabivanets, and L. A. Malinovskaya.
Gidrobiol Zh 12(3), p. 56-62, 1976.

Descriptors: *Organic acids, *Manganese, Isolation, *Bottom sediments, Hydrogen ion concentration, Water pollution.

Mn movement from bottom sediments into solution was studied, the pH value was varied and some carboxylic acids were present. Within the pH range peculiar to most natural water, an increase in the organic acid concentration favors Mn isolation from the bottom sediments and its accumulation in the water mass.--Copyright 1977, Biological Abstracts, Inc.
W77-07597

5C. Effects Of Pollution

CAGE CULTURE OF CHANNEL CATFISH IN A HEATED EFFLUENT FROM A POWER PLANT, THOMAS HILL RESERVOIR,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
T. H. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 327, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Thesis, May 1976. 90 p, 7 fig, 13 tab, 59 ref, append. OWRT B-039-MO(7), 14-31-0001-3296.

Descriptors: *Thermal pollution, Reservoirs, *Fish farming, *Channel catfish, Heated water, Missouri, *Growth rates, Water temperature, Water pollution effects, Electric powerplants.
Identifiers: *Thomas Hill Reservoir(Mo), *Cage culture(Catfish), Lethal temperature.

Channel catfish were cultured in floating cages in an 88-acre arm of water that received a thermal effluent. Fish were subjected to an average temperature of 33 C in August and 6.1 C in January. Corresponding temperatures in the Control Arm, where fish were also cultured, were 28.9 C in July and 2.8 C in January. The optimum temperature for growth (30 C) was determined experimentally. A growth increment of 236% was obtained for 200 fish at 32.7 C, no mortality was noticed. Fish maintained in the heated water for 2 years showed a mean gain of 872 g (range 861-2, 285 g), survival was 95%. Fish were cultured over winter and showed a significant difference in growth between the two Arms, mortality was 1.5%. There appeared to be no correlation between growth and mortality and stocking densities. The economic feasibility of the cage culture of catfish is discussed. (Witt-Missouri)
W77-07101

ASPECTS OF RESERVOIR-POWER STATION INTERACTIONS: SOME EFFECTS OF HEAT ON PHYSICO-CHEMISTRY, AUFWUCHS ECOLOGY AND PLANKTON METABOLISM,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
G. K. O'Bryan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 326, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Thesis, May 1976. 163 p, 13 fig, 39 tab, 130 ref. OWRT B-039-MO(6), 14-31-0001-3296.

Descriptors: *Thermal pollution, Reservoirs, Limnology, *Periphyton, *Phytoplankton, Primary productivity, *Metabolism, Heated water, Ecology, Physicochemical properties, *Missouri, Water pollution effects, Electric powerplants.
Identifiers: *Thomas Hill Reservoir(Mo).

An investigation of 26 physico-chemical parameters, plankton metabolism, and the accrual, composition and metabolism of Aufwuchs was conducted on a reservoir that received a thermal effluent. The only observed effects attributable to the thermal effluent (other than a slight temperature increase) were a slight increase in turbidity, percent saturation of oxygen and reduced ice cover. The heated effluent had no consistent effect on plankton community metabolism, or on the accrual of Aufwuchs. The Aufwuchs study indicates that short-term studies to characterize the tropic nature of waters, or for pollution surveys, are of questionable value because of variability within the community. (Witt-Missouri)
W77-07102

THE FORMATION OF A LOCAL POPULATION OF BREAM ABRAMIS BRAMA ORIENTALIS, IN THE HEATED WATER ZONE OF KONAKOVO POWER STATION,
Vserossiiskii Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khozyaistva, Konakovo (USSR). Upper Volga Div.

G. B. Sappo.
Journal of Ichthyology, Vol. 16(1), 1976, p. 35-45, 9 tab., 1 fig., 31 ref.

Descriptors: Freshwater fish, *Water temperature, *Fish genetics, *Fish physiology, *Fish populations, Fish types, *Thermal power, *Thermal pollution, Thermal power plants, Thermal water, *Warm-water fish, *Water pollution effects, Growth.
Identifiers: Volga River, Bream, Abramis brama, *Morphological changes, *Local population, Ivankovo Reservoir(USSR), *Warm water discharge, *Konakovo Power Station(USSR), Pharyngeal teeth, *Condition factor, Age composition.

Ecological and morphological changes are revealed in the bream, Abramis brama orientalis from various regions. The formation of a local population in the warm water zone of Ivan'kovo reservoirs is discussed. Changes in the structure of the pharyngeal teeth of bream from the zone strongly affected by the warm water discharged from Konakovo power station are recorded. Morphological and ecological features distinguishing bream from the control section allow the assumption that a separate population of this species is forming in the warm water zone. The abundance of this population amounted in 1972 to 1.3 million specimens, aged from 1 to 13 years. (Katz)
W77-07105

PHENALEN-1-ONE: OCCURRENCE IN A FUEL OIL AND TOXICITY TO MICROALGAE,
Texas Univ., Port Aransas. Marine Science Inst.
K. Winters, J. C. Batterton, and C. VanBaalen.
Environmental Science and Technology, Vol. 11(3), 1977, p. 270-272, 2 tab., 2 fig., 13 ref.

Descriptors: Oil, *Oil pollution, *Toxicity, *Algae, *Phytoplankton, *Toxicity, Bioassay, Laboratory tests, *Methodology, Water pollution effects, Spectrophotometry, Biochemistry, *Analytical techniques, Algicides, Cyanophyta, Diatoms, Chlorophyta.
Identifiers: *Microalgae, *Phenalen-1-one, No. 2 fuel oil, *Water soluble fractions, *Wavelength dependency, *Algal culture.

Phenalen-1-one (perinaphthenone) was isolated and characterized from the water soluble fraction of a No. 2 fuel oil. Phenalen-1-one had two very different effects on the growth of microalgae. With blue-green algae there was an abrupt toxicity, independent of wavelength, at 5 ppm. With two green algae toxicity was strongly wavelength dependent. In white light (Daylight fluorescent) 250 ppb was lethal; with this same lamp screened by a sharp-cut yellow filter (530 nm) growth rate was not affected until the concentration reached 10 ppm. The growth inhibition of a diatom by phenalen-1-one was also wavelength dependent, but the concentration required was some twenty fold that for green algae. (Katz)
W77-07106

SOME EFFECTS OF CHANNELIZATION ON THE FISHES AND INVERTEBRATES OF RUSH CREEK, MODOC COUNTY, CALIFORNIA,
California Univ., Davis, Div. of Wildlife and Fisheries Biology.
P. B. Moyle.
California Fish and Game, Vol. 62(3), p. 179-186, 1976. 4 tab., 11 ref.

Descriptors: *Channeling, *Biological communities, *Trout, Flood control, Running water, Dominant organisms, Freshwater fish, *Suckers, Invertebrates, *Biomass, Size, Growth rates, Electrofishing, On-site data collections, Statistics, *California, *Sculpins.
Identifiers: *Species composition, Modoc sucker, Catostomus microps, *Endemic species, Pit sculpin, Cottus pitensis, Rush Creek(Calif).

Channelized and unchannelized sections of the lower 7 km (4.3 miles) of Rush Creek, Modoc County, California were compared to determine the impact of channelization on fish populations, especially those of trout (Salmo gairdneri and S. trutta) and the rare endemic Modoc sucker (Catostomus microps), and invertebrate populations. Fish were captured with a backpack electrofisher, which provided a representative sample by numbers of the species present, although large fish were more vulnerable to capture than small fish. Channelized sections contained fewer and smaller trout, as well as a lower biomass, than the unchannelized sections. Modoc sucker numbers and biomass were also lower in the channelized sections. Only Pit sculpin (Cottus pitensis) were consistently more numerous in the channelized sections. Overall, total fish biomass in the channelized sections was less than one-third of that in the unchannelized sections. The biomass of invertebrates in the channelized sections was found to be less than one-third of that in the unchannelized sections. The invertebrate species composition of the two areas was also different. (Katz)
W77-07109

THE EFFECT OF TEMPERATURE AND THERMAL DISTRIBUTION ON GLYCOLYSIS IN TWO ROCKFISH SPECIES (SEBASTES),
Occidental Coll., Los Angeles, Calif. Dept. of Biology.
J. Helly, Jr.
Marine Biology, Vol. 37, p. 89-95, 1976. 2 fig., 6 tab., 15 ref.

Descriptors: *Marine fish, *Fish physiology, *Metabolism, *Water temperature, Juvenile fish, Animal metabolism, Fluctuations, *Biochemistry, Chemical analysis, Laboratory tests, On-site data collection, SCUBA diving.
Identifiers: Sebastes mystinus, Sebastes serranoides, Blue rockfish, Olive rockfish, *Glucose metabolism, *Embden-Meyerhof glucose metabolism pathway, *Hexose monophosphate shunt, Tissue samples, *Thermal distribution, *Rockfish.

Studies on the effects of temperature on the activities of Embden-Meyerhof (EM) glycolysis and the hexose monophosphate shunt (HMP) in fishes have dealt mainly with exotic and/or acclimated fishes. This study reports the effects of short-term reductions in temperature on EM and HMP activity in two closely related species of temperature fishes (Sebastes spp.) and its possible relation to the thermal distribution of the species. Thermal distribution data were collected by SCUBA for S. mystinus and S. serranoides in King Harbor, Redondo Beach, California. Activities of the pathways were determined in liver-tissue studies, using glucose-14C and liquid scintillation techniques following the method of Hochachka (1968) with modifications. The data were analyzed by distribution-free methods. Tissue studies indicated HMP activity in both species at lowered temperature (5 degrees C), but only in S. serranoides at 15 degrees C. Results indicate that S. mystinus is capable of instantaneous temperature compensation, possibly related to its tendency to occupy cold waters. (Katz)
W77-07110

RESPONSES TO ODORS BY FINGERLING CUTTHROAT TROUT FROM YELLOWSTONE LAKE,
Western Illinois Univ., Macomb. Dept. of Biological Sciences.
L. A. Jahn.
The Progressive Fish-Culturist, Vol 38(4), p 207-210, 1976. 1 fig, 2 tab, 14 ref.

Descriptors: *Cutthroat trout, *Fish migrations, *Odor, Trout, Juvenile fish, Laboratory tests, *Fish physiology, Training, Statistics, *Fish behavior, *Wyoming.
Identifiers: Osmic, Anosmic, Homing ability, *Yellowstone Lake(Wyo).

Normal, osmic, and anosmic fingerling cutthroat trout were tested for response to an odorous solution of aqueous extract of fingerling cutthroat trout. No statistically significant differences were observed. Some trout were trained, with a reward and punishment system, to respond to an odorous solution of tuna extract. The food-reward trained fish responded strongly after 48 trials but ceased to respond when rendered anosmic. The results of the punishment experiment were inconclusive. (Katz)
W77-07111

RESPONSES TO CRUDE OIL CONTAMINATION BY CRICOTOPUS (CRICOTOPUS) BICINCTUS AND C. (C.) MACKENZIENSIS (DIPTERA: CHIRONOMIDAE) IN THE FORT SIMPSON AREA, NORTHWEST TERRITORIES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
D. M. Rosenberg, A. P. Wiens, and O. A. Saether.
Journal of the Fisheries Research Board of Canada, Vol 34, p 254-261, 1977. 2 fig, 3 tab, 16 ref.

Descriptors: *Oil pollution, *Diptera, *Artificial substrates, *Larvae, Oil, Water pollution effects, *Benthic fauna, Bioassay, On-site investigations, Algae, Biomass, Biological communities, Dominant organisms, Life cycles, *Canada.
Identifiers: Norman Wells crude oil, *Cricotopus bicinctus, *Cricotopus mackenziensis, Northwest territories.

Cricotopus (Cricotopus) bicinctus (Meigen) and C. (C.) mackenziensis Oliver, two common species of Chironomidae in the Fort Simpson area, N.W.T., were examined for changes resulting from experimental field exposure to Norman Wells crude oil. Larvae of both species were always present in higher numbers on oiled than unoiled artificial substrates but numbers of C. bicinctus increased more quickly than C. mackenziensis in response to the oil. C. mackenziensis larvae occurred in higher numbers than C. bicinctus larvae on unoiled artificial substrates. C. bicinctus tended to dominate C. mackenziensis on oiled artificial substrates. Size of larvae, as measured by head capsule width, was unaffected by increased food supply during periods of maximum algal biomass on oiled artificial substrates. Larvae on oiled artificial substrates apparently produced part of another generation when compared to larvae on unoiled artificial substrates. (Katz)
W77-07113

EFFECT OF MERCURY ON THE SURVIVAL, RESPIRATION, AND GROWTH OF POSTLARVAL WHITE SHRIMP, PENAEUS SETIFERUS,
Texas A and M Univ., College Station. Dept. of Biology.
F. A. Green, Jr., J. W. Anderson, S. R. Petrocelli, B. J. Presley, and R. Sims.
Marine Biology, Vol 37, p 75-81, 1976. 7 tab, 22 ref.

Descriptors: *Mercury, *Toxicity, *Shrimp, Heavy metals, Water pollution effects, Path of pollutants, *Mortality, Juvenile growth stage, Size, Respiration, *Growth rate, *Bioassay, Laboratory tests, *Respiration.
Identifiers: LC50, *Acute toxicity, Chronic exposure, Molting rate, *White shrimp, Penaeus setiferus.

The results of toxicity experiments have shown that a level of 17 ppb ionic mercury is acutely toxic (96-h LC50) to postlarval white shrimp (Penaeus setiferus). In addition, the size of the shrimp, within the range tested (7 to 35 mm) did not significantly alter the toxicity values of mercury to this species. Fifty-seven days pre-exposure to low levels of mercury (0.5 and 1.0 ppb) had no effect on the acute toxicity (96-h LC50) of mercury to the shrimp. The effect of chronic exposure to low

levels of mercury on the respiratory rate, growth, and molting rate of postlarval P. setiferus was studied, and the results showed that 60 days exposure to 0.5 and 1.0 ppb mercury did not significantly affect any of these parameters for the post larvae. (Katz)
W77-07114

KINETICS OF LAMPRICIDE (TFM, 3-TRIFLUOROMETHYL-4-NITROPHENOL) RESIDUES IN MODEL STREAM COMMUNITIES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. W. Maki, and H. E. Johnson.
Journal of the Fisheries Research Board of Canada, Vol 34, p 276-281, 1977. 3 fig, 1 tab, 5 ref.

Descriptors: *Lampreys, *Larvicides, *Pesticide kinetics, Aquatic animals, *Absorption, *Pesticide residues, Water pollution effects, *Path of pollutants, Carbon radioisotopes, Laboratory tests, Aquatic plants, *Kinetics.
Identifiers: *Bioconcentration, Excretion, Rate of uptake, *TFM, 3-trifluoromethyl-4-nitrophenol.

The bioconcentration and elimination rates of lamprey larvicide, 14C-TFM (3-trifluoromethyl-4-nitrophenol), were determined for 20 plant and animal species during experimental lamprey control treatments in six indoor model streams. A two-component curve consisting of a rapid initial uptake rate during the first 2 h followed by a reduced linear rate for the remainder of the 24-h exposure best describes the uptake curve for all species examined. The bioconcentration factors (BCF) ranged from 1.1 to 95.5 for animal components and from 0.7 to 12.2 for the plant species. Macroinvertebrate species with soft, relatively permeable integuments accumulate significantly higher residue concentrations (mean BCF=45.0) than those species with hard chitinized or calcareous exoskeletons (mean BCF=11.9). Rates of uptake during the linear phase range from 0.36 micrograms per gram per hour for the crayfish Orconectes propinquus to 17.9 micrograms per gram per hour for the caddisfly larvae Brachycentrus americanus. Rates of loss of TFM accumulations correlate with water current and substrate associations. The mean half-life of TFM is 17.8 h for riffle species and 105.9 h for pool-dwelling species. Half-life figures vary from 7.2 h for the crayfish to 5295 h for annelid worms. The longer half-lives observed for several pool species suggest continued accumulation of 14C-labeled residues from the organic matter from the pool bottoms. (Katz)
W77-07115

ROLE OF MUSSELS MYTILUS EDULIS IN REMOVAL OF PETROLEUM PRODUCTS FROM SEAWATER (UNDER EXPERIMENTAL CONDITIONS),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
Y. V. Voyko, and Y. M. Petrov.
Hydrobiological Journal, vol. 11(2), p. 19-24, 1975. 3 fig., 3 tab., 10 ref.

Descriptors: *Oil pollution, *Mussels, *Biodegradation, Oil, *Water pollution effects, Toxicity, Path of pollutants, Laboratory tests, Bioassay, Fluorescence, Oxidation, Methodology.
Identifiers: Bioaccumulation, Bunker fuel oil, Lubricating oil.

The dynamics of behavior of petroleum products in seawater shortly after addition were investigated. The purification of the water by the filter feeder Mytilus edulis was measured. (1) Mussels contribute to removal of petroleum oils from seawater because of their capacity to filter water and excrete pseudofeces with occluded particles of the oil. In this way oil is transferred from the water to the sediments. (2) In tanks with mussels, the water was purified twice as fast as in the control. At water temperature of 3 to 10 degrees C, the oil concentration in the water apparently decreased because of partial oxidation and rise of the oil drops to the surface. (3) The green fluorescence spot on the chromatogram, which appeared 3 weeks after the start of the experiment, was probably an indication that the oxidation of the oil had started. (4) After 3 weeks only 7% of the initial amount of the petroleum oil remained in the tanks with mussels. Of this amount, about 1.4% was deposited by the aquatic organisms on the bottom of the tanks, about 5.6% remained in the surface film, and about 0.2% was still dissolved. (Katz)
W77-07116

THE UTILIZATION OF DISSOLVED FREE AMINO ACIDS BY ESTUARINE MICROORGANISMS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Biology.
C. C. Crawford, J. E. Hobbie, and K. L. Webb.
Ecology. 55(3), p 551-563, 1974.

Descriptors: Bacteria, Algae, Amino acids, Estuaries, Microorganisms, *Carbon, North Carolina, Organic compounds, Chromatography, Pollutant identification, Primary productivity, Water pollution effects, Absorption.
Identifiers: *Pamlico River estuary(NC).

The importance of bacteria in the cycling of C in the Pamlico River, North Carolina, estuary was studied by measuring the rates of intake of organic compounds. Methods allowed analysis with the Michaelis-Menten kinetics equations and both the rates of uptake of dissolved free amino acids (DFAA) and glucose as well as the percentage of C subsequently respired as CO2 were determined. In addition, the concentrations of the amino acids in the water were determined using ion exchange chromatography. Other tests included measurements of primary productivity and of the effects of the other amino acids in the water upon the uptake of 1 amino acid. There was considerable variation in the heterotrophic activity over time and distance probably caused by patchiness in distribution of plankton and dissolved compounds in the water. Although there is some competition between amino acids being taken up, the effect upon kinetics measurements is probably negligible. Mutual inhibition was found between the similar amino acid pairs glutamic acid and aspartic acid, threonine and serine, glycine and alanine and leucine and alanine. Highest V max values were found during the summer months and early fall and ranged from a high of 69.42 micro g C/l.h for alanine in Aug. to less than 0.20 micro g C/l-h for most of the substrates tested in the colder months. The V max values for glucose uptake (0.06-9.64 micro g C/l-h) indicate that this estuarine system is one of the most microbially-active environments tested. The orders of abundance and concentrations of individual amino acids were similar to those reported for other bodies of water. When the natural concentration of a substrate is known the actual velocity of uptake (vn) or flux for that substrate may be found. Flux rates were only 1%-10% of the V max values in the coldest months; the highest values were found in the warmest months. At each experimental concentration of amino acid, a certain amount was taken up, and a percentage of this amount was oxidized to CO2. This percentage was constant for a particular amino acid in spite of varying experimental times, substrate concentrations and temperatures. Failure to correct uptake data for this respiratory loss introduces significant underestimation. The production of particulate material was calculated by correcting total uptake figures for each amino acid by its characteristic respiration percentage.--Copyright 1974, Biological Abstracts, Inc.
W77-07117

COMPARISON OF ARTIFICIAL AND NATURAL SEA WATER AS CULTURE MEDIA FOR JUVENILE LOBSTERS,
California Univ., Davis. Inst. of Marine Resources.
M. L. Gallagher, and W. D. Brown.
Aquaculture, vol. 9, p. 87-90, 1976. 1 fig., 2 tab.

Descriptors: *Lobsters, *Aquiculture, *Water quality, *Growth rates, *Commercial shellfish, *Juvenile growth stage, Laboratory tests, Water temperatures, Statistics, Environmental effects, Weight, Length, Methodology, Sea water.
Identifiers: Artificial seawater, Natural seawater.

Fourth-stage and fifth-stage lobsters were placed in artificial or natural sea water and fed live adult brine shrimp for 90 days. Water quality parameters and temperature were monitored. Carapace length and body weight measurements were made at the end of the experimental periods. In trial one, growth was significantly better ($P<0.05$) in artificial sea water. In trial two, growth in artificial sea water was greater than in natural sea water, although the difference in growth was not significant. It was concluded that artificial sea water is satisfactory medium for culturing juvenile lobsters, and in some cases may result in better growth. (Katz)
W77-07118

OCCURRENCE OF TOXIC BIVALVES IN ASSOCIATION WITH THE BLOOM OF GONYAULAX SP. IN OWASE BAY,
Tokyo Univ. (Japan). Lab. of Marine Biochemistry.
Y. Hashimoto, T. Noguchi, and R. Adachi.
Bulletin of the Japanese Society of Scientific Fisheries, vol. 42(6), p. 671-676, 1976. 3 fig., 1 tab., 14 ref.

Descriptors: *Chromatography, *Toxins, *Dinoflagellates, *Commercial shellfish, Biochemistry, Public health, Red tide, Water pollution sources, Mussels, Clams, Laboratory tests, Bioassay, Chemical analysis, Marine algae, Marine microorganisms, Bays.
Identifiers: *Gonyaulax catenella, Saxitoxin, Tetrodotoxin, *Owase Bay(Japan).

The bloom of a toxic dinoflagellate, tentatively identified as Gonyaulax catenella, occurred in Hikimoto-ura, Owase Bay, on January 26, 1975 for two weeks making bivalves moderately toxic although there were no cases of poisoning. The symptoms induced in mice by intraperitoneal injection of the extracts from the dinoflagellate, mussel and short-necked clam, were very similar to those induced by saxitoxin or tetrodotoxin. The toxic principles in short-necked clams were fractionated and partially purified by using Amberlite IRC-50, activated charcoal and Sephadex G-15. Four toxic components were obtained of which two major components clearly differed from saxitoxin in chromatographic behavior. (Katz)
W77-07119

ALTERATION IN THE TOXICITY OF TISSUE LIPIDS WITH THE ADAPTATION OF FISHES TO OSMOTIC PRESSURE CHANGES IN THE ENVIRONMENT,
Moscow State Univ. (USSR). Dept. of Biophysics.
V. I. Chernyshov, and S. K. Magomedov.
Journal of Ichthyology, Vol 15(2), p 346-349, 1975. 1 fig, 13 ref.

Descriptors: *Salinity, *Lipids, *Fish physiology, Freshwater fish, Marine fish, Osmotic pressure, Lethal limits, Metabolism, Toxicity, Mortality, Biochemistry, Animal pathology, Carp.
Identifiers: Grass carp, Ctenopharyngodon idella, Caspian silverside, Atherina mochon caspia, Caspian asp, Aspius aspius taeniatus.

Stenohaline and euryhaline fish were tested for toxicity of the lipids of the liver, gills and blood at

different stages of osmo-adaptation to salinities ranging from preferred to lethal. Osmotic stress increases the metabolic rate which increases the peroxide oxidtion of lipids and toxic products accumulate which may disrupt the active transport of ions in the gills. (Katz)
W77-07120

SEASONAL CHANGES OF INVERTEBRATE POPULATIONS IN THE POLLUTED RIVER MEDLOCK,
Salford Univ. (England). Dept. of Biology.
S. Frost, M. T. L. Chiu, and M. P. Thomas.
Environmental Pollution, Vol 11, p 223-242, 1976. 14 fig, 2 tab, 11 ref.

Descriptors: *Water pollution effects, *Biological communities, *Seasonal, Industrial effluents, Sewage effluents, Flow control, Water treatment, *Water management(Applied), Water chemistry, Recreation, On-site data collections, Sampling, Protozoa, Benthic animals, Salmon, Invertebrates.
Identifiers: Invertebrate population, *River Medlock(Eng).

The biological and chemical condition of the river is indicated by seasonal changes in invertebrate populations in relation to certain prevailing environmental factors. Used as a salmon fishery and road in the early days, the river Medlock became an industrial sewer in the nineteenth/twentieth centuries. Controlled flow and increased effluent control now ensures that environmental changes within the river will encourage biological and chemical recovery. Techniques are outlined which could be used in a monitoring program to detect conditions suitable for increasing the value of the water in relation to country park and associated developments along the banks of the river valley. (Katz)
W77-07121

USE OF QUICKLIME TO INCREASE OYSTER SEED PRODUCTION,
National Marine Fisheries Service, Highland, N.J. Sandy Hook Lab.
C. L. MacKenzie, Jr.
Aquaculture, Vol 10, p 45-51, 1977. 2 fig, 7 ref.

Descriptors: *Oysters, *Aquiculture, *Commercial shellfish, *Pesticides, *Shellfish farming, *Artificial substrates, *Calcium compounds, Juvenile growth stage, Benthos, Predation, On-site investigations, Laboratory tests.
Identifiers: *Calcium oxide, *Oyster spat, *Fouling, Quicklime, Starfish, Asterias forbesi, Oyster drills, Urosalpinx cinerea, Eupleura caudata, Oyster setting frequency.

A single application of quicklime (calcium oxide), spread at a rate of 6.75 metric tons/ha, was used to prepare dormant oyster setting beds for spat production. of 2000 ha in Long Island Sound, Connecticut, 1200 ha had sufficient shells to cover at least 75% of the bottom. However, these shells had a continuous fouling organism layer that would prevent significant oyster setting. Many beds had predator populations of sea stars (Asterias forbesi) and oyster drills (Urosalpinx cinerea and Eupleura caudata). Quicklime cleans the shells by killing fouling organisms, and also controls sea stars and embryonic oyster drills. When the supply of clean shells for annual spreading on the setting beds is limited, use of the quicklime method prepares greater quantities of shells for possible oyster set. (Katz)
W77-07122

SHELL DEFORMITY AMONG SCALLOPS (ARGOPECTEN IRRADIANS LAMARK) CULTURED IN A RECIRCULATING SEAWATER SYSTEM,
Delaware Univ., Lewes. Marine Studies Complex.
C. E. Epifanio.
Aquaculture, Vol 9, p 81-85, 1976. 3 fig, 9 ref.

Descriptors: *Mollusks, *Aquiculture, *Commercial shellfish, *Shellfish farming, *Nutrition requirements, *Marine algae, *Growth rates, Laboratory tests, Diets, Animal physiology, Productivity, *Pathology.
Identifiers: *Bay scallop, *Argopecten irradians, Recirculating seawater system, Shell deformity.

Bay scallops, Argopecten irradians, were held in a recirculating seawater system for 25 weeks and fed a diet consisting of four species of cultured algae. The rate of growth of the shellfish was less than reported for scallops from natural areas, and a gross shell deformity was noted among most of the scallops after 18 weeks of culture. The deformity may have been related to an indequate diet. (Katz)
W77-07123

A NATURAL POLLUTION EXPERIMENT: THE EFFECTS OF A SEWAGE STRIKE ON THE FAUNA OF THE THAMES ESTUARY,
King's Coll., London (England). Dept. of Zoology.
R. Sedgwick, and D. R. Arthur.
Environmental Pollution, Vol 11, p 137-160, 1976. 10 fig, 17 ref.

Descriptors: *Sewage effluents, *Water pollution effects, *Estuarine environment, Water pollution, Sewage treatment, Activated sludge, Mortality, Biological communities, Water quality, Water chemistry, Oxygen sag, On-site data collection, Weather.
Identifiers: *Thames estuary(Eng).

Arising from the withdrawal of labor by a national union, this case history of acute pollution in the Thames estuary in 1970 illustrates the complexity of interacting parameters, and of recovery from the polluted state. It deals with the chemical changes in the estuary, the effects of weather conditions on the hydrological pattern, concomitant with other physical parameters, and on the quantitative distribution of the estuarine fauna in relation to these variables. The effects of the polluting load on the fauna are then assessed by comparing the changes between it and previous years and with that immediately succeeding it. (Katz)
W77-07124

SURVIVAL AND REPRODUCTION OF GAMMARUS SPP. (AMPHIPODA) FOLLOWING SHORT-TERM EXPOSURE TO ELEVATED TEMPERATURES,
New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.
T. C. Ginn, W. T. Waller, and G. J. Lauer.
Chesapeake Science, Vol 17(1), p 8-14, 1976. 1 fig, 8 tab, 8 ref.

Descriptors: *Amphipods, *Water temperature, *Mortality, Fish food organisms, Thermal pollution, Lethal limits, Water pollution effects, Bioassay, Cooling water, Laboratory tests, Reproduction.
Identifiers: Gammarus, *Latent mortality.

Gammarus spp. (G. daiberi and G. tigrinus) experienced no increased latent mortalities for periods up to 10 days after being exposed to an 8.3 C delta T above an ambient temperature of 25.5 C for periods up to 60 minutes. An 11.1 C delta T above an ambient temperature of 26.5 C resulted in significant reductions in survival in groups of Gammarus spp. exposed for 30 and 60 minutes. No significant mortalities were observed, however, following a 5-minute exposure to the 11.1 C delta T. At an ambient temperature of 11.7 C, gammarus spp. exposed to 16.7 C delta T's for periods up to 180 minutes displayed no increased mortalities 10 days after exposure. A sustained 17-day exposure of Gammarus spp. to a 15.6 C delta T at ambient temperatures of 11.2 to 7.1 C resulted in no increased mortalities and stimulated reproductive behavior. Subsequent reproductive activities were not affected by up to 60-minute exposures of mature Gammarus spp. to an 8.3 C delta T at an ambient temperature of 26.0 C. The same exposure also did not affect the release of young by ovigerous female Gammarus spp. An 11.0 C delta T for 30 minutes resulted, however, in almost no release of young from ovigerous females. (Katz)
W77-07125

AN INDUSTRIAL VIEW OF BIOLOGICAL MONITORING,
FMC Corp., Philadelphia, Pa.
For primary bibliographic entry see Field 5A.
W77-07126

DYNAMICS OF STORAGE OF ORGANOCHLORINE POLLUTANTS IN HERRING GULLS,
Wisconsin Univ., Madison. Dept. of Wildlife Ecology.
D. W. Anderson, and J. J. Hickey.
Environmental Pollution, Vol 10, pp 183-200, 1976. 3 fig, 5 tab, 74 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Gulls, Pesticides, Water pollution effects, Path of pollutants, *DDE, *DDT, *Polychlorinated biphenyls, Food chains, Juvenile growth stage, Seasonal, Fluctuations, Laboratory tests.
Identifiers: *Herring gulls, *Bioconcentration, Larus argentatus, Body-burden.

Several organochlorine pollutants were studied over the period of one annual cycle in caged juvenile and wild-collected adult herring gulls (Larus argentatus) from Lake Michigan. Fish, mostly alewives (Alosa pseudoharengus), comprised the major year-round food items in the wild; alewives were also fed to the caged juveniles. Fish residues averaged around 3 mg/kg of p,p'-DDE, 2 mg/kg p,p'DDT + p,p'-TDE, and 2 mg/kg apparent PCBs. Juvenile body-burdens of DDE and PCBs showed a continual buildup after fledging, then a temporary dynamic equilibrium, related only in part to annual lipid deposition. Maximum body-burdens were reached in both juveniles and adults when winter fat deposits were declining prior to the breeding season-followed by a return to dynamic equilibrium. Residues of DDT and TDE followed closely the annual pattern of lipid deposition in both juveniles and adults. Total body-burdens in both age classes were similar after the buildups to equilibrium in juveniles in their eighth month after fledging. Seasonal variations of residues of DDE and PCBs were characterized by two phases in adults and three in juveniles, which gradually assumed the adult cyclic pattern. The maximum body-burdens attained by caged juveniles fed a diet of Lake Michigan alewives were 290 mg/kg DDE, 19 mg/kg DDT + TDE, and 200 mg/kg apparent PCBs. Residues in wild adults at the same time were 300, 4, and 200 mg/kg of the same residues. Apparent PCBs and DDE were highly accumulative, although DDE levels resulted from dietary DDE, as well as conversion from DDT. (Katz)
W77-07127

SURVIVAL OF MAYFLY LARVAE UNDER MINE ACID CONDITIONS,
Ohio Univ., Athens. Dept. of Zoology and Microbiology.
S. Napier, Jr., and W. D. Hummon.
Internationale Revue Gesamten Hydrobiologie, Vol 61(5), p 677-682, 1976. 1 fig, 2 tab, 15 ref.

Descriptors: *Mine acids, *Biological communities, *Mayflies, *Food chains, Mine drainage, Water pollution, Water pollution effects, Toxicity, Mortality, Dragonflies, Predation, Larvae, Hydrogen ion concentration, Feeding rates, Fish food organisms, On-site data collection, Laboratory tests.
Identifiers: Riffle communities.

Mayfly larvae were abundant and diverse in riffle zones of three control streams in southeastern Ohio. But none were found in such zones of three streams having current or past histories of mine acid pollution, despite vegetative recovery of reclaimed land bordering two of the streams. Laboratory studies showed stepwise increases in non-predatory mortality of mayfly larvae with increased mine acidity. Dragonfly larvae predation on mayfly larvae was constant at pH 8.1-4.1, but decreased at pH 3.1 despite tolerance of dragonfly larvae to low pH conditions. Extensive acid mine pollution thus may threaten aquatic biota through removal of food sources or reduced feeding rates as well as through direct mortality. (Katz)
W77-07128

THE DYNAMICS OF METALS IN THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA. II. ENVIRONMENTAL EFFECTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Medicine.
J. M. Frazier.
Chesapeake Science, Vol 17, No 3, p 188-197, 1976. 6 fig, 3 tab, 29 ref.

Descriptors: *Metals, *Heavy metals, *Commercial shellfish, *Oysters, *Path of pollutants, *Absorption, *Growth rates, *Manganese, *Iron, *Zinc, *Copper, *Cadmium, Water pollution effects, Seasonal, Fluctuations, *Chesapeake Bay, On-site investigations, Bioassay, Biochemistry, Water chemistry.
Identifiers: *Bioaccumulation, Shell thinning.

The dynamics of Mn, Fe, Zn, Cu and Cd in the shell and soft tissues of the American oyster, Crassostrea virginica, were observed in oysters exposed in situ to a metal-contaminated environment from September, 1972 until August, 1973. Zn and Cu accumulated in soft tissues of exposed oysters reaching levels of 4100 micrograms Zn/gm and 450 micrograms Cu/gm compared to 1700 micrograms Zn/gm and 60 micrograms Cu/gm for controls (dry weight basis). The relative enhancement of metals in oyster soft tissues exposed to the contaminated environment over controls reflected the pattern of metal contamination in sediments. Although growth of the oysters, as measured by soft tissue dry weight and shell dimensions, was identical, shells of exposed oysters were significantly thinner than controls (16%). Trace metal incorporation into shell was affected with Mn deposition suppressed and Fe, Zn and Cu slightly increased. Uptake of metals by oyster soft tissues was seasonally dependent with rapid uptake occurring in the summer and fall but delayed uptake occurring in the early spring. (See also W76-01938) (Katz)
W77-07129

EFFECTS OF INCREASED WATER TEMPERATURE ON DAPHNIA PULEX,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
D. R. Craddock.
Fishery Bulletin, Vol 74(2), p 403-408, 1976. 1 fig, 5 tab, 11 ref.

Descriptors: *Daphnia, *Water temperatures, *Lethal limits, *Reproduction, Zooplankton, *Thermal pollution, Cooling waters, Water pollution effects, Laboratory tests, Columbia River, Powerplants, Bioassay.
Identifiers: Daphnia pulex, Acclimation.

Techniques were developed to study the effects of increased water temperature on certain zooplankters; specific studies were conducted on Daphnia pulex, an abundant and important zooplankter of the lower Columbia River. Study methods simulated prolonged exposure to constant high temperatures in thermal discharges and short exposures to increased temperatures in condensers of cooling systems. Effects were evaluated on the basis of survival and reproduction for periods ranging from 34 to 90 days. The time to death of 50% of the D. pulex, both mature and young, was less than 24 h at temperatures above 27 degrees C. Temperatures of 27 degrees C and below required an exposure of at least 192 h to cause 50% mortality. The young females were more tolerant of temperature increases than older females. The greatest reproduction by older females was at the control temperature (15 degrees C), whereas reproduction by the young females was low at lower temperatures. No reproduction occurred above 27 degrees C. Two groups of D. pulex (one from the Seattle, Wash., area and the other from the Columbia River) studied at increased temperatures for prolonged periods revealed similar patterns of survival and reproduction, but the Columbia River group appeared less tolerant of increased temperatures. A short exposure (15 min) to increased temperatures up to 30 degrees C had little effect on survival and reproduction. It was concluded that temperatures should not exceed 26 or 27 degrees C for prolonged periods or 30 degrees C for more than 15 min to protect D. pulex populations. (Katz)
W77-07130

PRESENT AND HISTORICAL SPAWNING GROUNDS AND NURSERIES OF AMERICAN SHAD, ALOSA SAPIDISSIMA, IN THE DELAWARE RIVER,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
M. E. Chittenden, Jr.
Fishery Bulletin, Vol 74(2), p 343-352, 1976. 1 fig, 2 tab, 42 ref.

Descriptors: *Commercial fish, *Spawning, *Water pollution effects, Anadromous fish, Fish management, Fish barriers, Dams, Fish ladders, Water pollution, Fish migration, Sampling, Fish behavior, *Delaware River.
Identifiers: American shad, Alosa sapidissima, Spawning grounds.

Spawning occurs from late May into July but mainly in a 3-wk period from late May to mid-late June and ends progressively later proceeding upstream. Light intensity seemed to regulate when spawning began each day. Fish selected shallow riffle areas in preference to pool habitat for spawning. Except for the most grossly polluted tidal water, spawning and nursery areas now extend throughout fresh water of the main Delaware and into the East and West branches. The most important spawning grounds and nurseries are now located from Port Jervis, N.Y., to Hancock, N.Y., and extend into the lower East Branch; this has probably been the case since 1910-1920. There has been a fundamental upstream shift in the chief spawning grounds and nurseries since the decline of the Delaware River shad runs, because these historically extended downstream from about Delaware Water Gap, Pa., and included tidal water. Reasons for this shift suggest intrastream homing. Only a small proportion of the historical nursery now contributes to production. Nursery and spawning areas now contribute to production of adults in proportion to their distance from Philadelphia, Pa. The extent of the spawning and nursery area since about 1910-20 has probably expanded and contracted around a core area in the upper Delaware near Hancock. Future prospects of Delaware River shad depend upon water quality in the tidal area and the proposed Tocks Island dam. Extirpation of the remnant runs is a distinct possibility. (Katz)
W77-07131

THE EVALUATION OF TOXIC EFFECTS OF CHEMICALS IN FRESH WATER BY USING FROG EMBRYOS AND LARVAE,
California Univ., Irvine. Dept. of Anatomy; and California Univ., Irvine. Dept. of Developmental and Cell Biology.
G. Greenhouse.
Environmental Pollution, Vol 11, p 303-315, 1976. 1 fig, 7 tab, 21 ref.

Descriptors: *Testing procedures, *Frogs, *Chemical wastes, Bioassay, *Methodology, Embryonic growth stage, Larvae, Water pollution effects, Toxicity, Mortality, Laboratory tests, Laboratory animals, Bioindicators.
Identifiers: Leopard frog, Rana pipiens, South African clawed toad, Xenopus laevis, Amines.

The objective was to establish a pollutant test system using embryos and larvae of frogs. Two species of frog served as test animals: Rana pipiens, the leopard frog; and Xenopus laevis, the South African clawed toad. The system was directed at assaying the effects of environmental pollutants resulting from US Air Force Operations on viability and development of the test species. Efforts focused on determination of lethal and teratogenic levels of compounds specified by the Air Force. Work performed using the above test system to screen two groups of compounds is described. Group one consisted of three amines, N-phenyl-oc-naphthylamine, octyl-phenyl-oc-naphthylamine and p,p'dioctyldiphenylamine. Only N-phenyl-oc-naphthylamine was found to have toxic effects on developing frogs. Group two consisted of hydrazine, methylhydrazine, and dimethylhydrazine. All of these latter compounds were toxic to developing frogs. (Katz)
W77-07132

EXPERIMENTAL SUBSTANTIATION OF MAXIMUM PERMISSIBLE PROPACHLOR (RAMROD) CONCENTRATIONS IN WATER, (IN RUSSIAN),
Academy of Medicine, Sofia (Bulgaria). Center for Hygiene.
For primary bibliographic entry see Field 5A.
W77-07133

EFFECTS OF PASSAGE THROUGH POWER PLANT COOLING SYSTEMS ON ESTUARINE COPEPODS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. R. Heinle.
Environmental Pollution, Vol 11, p 39-57, 1976. 3 fig, 11 tab, 20 ref.

Descriptors: *Water temperature, *Chlorination, *Mortality, *Copepods, Electric powerplants, Pumping, Turbines, Water pollution effects, Toxicity, Estuarine environment, On-site data collection, Sampling, Statistics, Chesapeake Bay, Chlorine, Methodology, *Thermal pollution.
Identifiers: Vital staining techniques.

Vital staining techniques were used to measure mortalities of copepods pumped through three electric power plants located at low-salinity estuarine sites. Elevated temperatures and pumping caused little mortality, while the use of chlorine as a biocide caused extensive mortalities. The three species of copepods sampled seemed to have different sensitivities to the perturbations examined. (Katz)
W77-07134

VARIATIONS IN THE LEAD, ZINC AND CALCIUM CONTENT OF DENDROBAENA RUBIDA (OLIGOCHAETA) IN A BASE METAL MINING AREA,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
M. P. Ireland, and R. J. Wooton.
Environmental Pollution, vol. 10, p. 201-208, 1976. 3 fig., 2 tab., 15 ref.

Descriptors: *Oligochaetes, *Soil contamination, *Lead, *Zinc, Calcium, *Mining, Seasonal, Fluctuations, Absorption, On-site data collection, Biochemistry, Benthos.
Identifiers: *Bioconcentration, *Bioaccumulation.

A study was made of the concentrations of lead, zinc and calcium in Dendrobaena rubida (Savigny)

taken at different times of the year and at three different sites. Lead levels in earthworms reflected the levels in the soils and the highest concentrations occurred in the winter months. Zinc appeared to be unrelated to soil levels at the site where the level of zinc in the soil was high. At the sites with lower levels of zinc in the soil the lowest concentration of zinc in earthworms was found in November. Earthworm calcium values were inversely proportional to the soil levels but monthly variations were inconsistent. There was a good correlation in earthworms between lead and calcium at the sites with high levels of lead in the soil. The concentration of metal in D. rubida is discussed in relation to seasonal changes, regulation and lead/calcium antagonism. (Katz)
W77-07135

EFFECTS OF BENZENE (A TOXIC COMPONENT OF PETROLEUM) ON SPAWNING PACIFIC HERRING, CLUPEA HARENGUS PALLASI,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
J. W. Struhsaker.
Fishery Bulletin, vol. 75(1), p. 43-50, 1977. 1 fig., 4 tab., 14 ref.

Descriptors: *Herring, *Fish reproduction, *Oil pollution, Spawning, *Oil wastes, Water pollution effects, Toxicity, Mortality, Fish management, Carbon radioisotope, Laboratory tests, Fish physiology, Statistics, Marine fish.
Identifiers: Clupea harengus pallasi, Benxene, Pacific herring.

When female Pacific herring were exposed to low (parts per billion) levels of benzene for 48 h just prior to their spawning, a significant reduction occurred in survival of ovarian eggs and resultant embryos and larvae through yolk absorption. The reduction in survival of ovarian eggs was approximately 10-25%, for embryos from fertilization to hatching, 26%, and for embryos and larvae through yolk absorption, 43%. Exposure to benzene also induced premature spawning and resulted in aberrant swimming behavior and disequilibrium in adults of both sexes. The maximum accumulation of 14C-labeled benzene and/or metabolites in ovarian eggs (14 times initial concentration in water in 24-48 h; 1.4 microliters per gram from 0.1 microliters per liter) was greater than in later egg and larval stages as measured in other experiments. Conservatively estimating the total reduction in survival in these experiments to be approximately 50% through yolk absorption, it is surmized that the effect of exposing spawning herring to only one toxic component of petroleum could have a significant effect on the population. The fish in these experiments were exposed to relatively high parts per billion levels, but they were exposed for a relatively short period (48 h); it is probable that in the estuary, if chronically exposed over a longer period of time to low parts per billion levels of aromatic compounds, the populations could be seriously affected. When the spawning female herring is compared with other life history stages, we find that the spawning stage is clearly the most sensitive of those tested. If fishes prove generally to be most sensitive to petroleum components during their spawning seasons, fishery management decisions should take this factor into consideration in protecting the resources. (Katz)
W77-07137

THE RATE OF MICROBIAL DEGRADATION OF OIL IN A BEACH GRAVEL COLUMN,
University Coll. of North Wales, Bangor. Marine Science Labs.
For primary bibliographic entry see Field 5B.
W77-07138

OBSERVATIONS ON A PEAT BOG'S ABILITY TO WITHSTAND INCREASING PUBLIC PRESSURE,
University of Wales Inst. of Science and Technology, Cardiff.
F. M. Slater, and A. D. Q. Agnew.
Biological Conservation, vol. 11, p. 21-27, 1977. 2 fig., 1 tab., 18 ref.

Descriptors: *Bogs, *Peat, *Damages, Wetlands, Management, Trafficability, Recreation, Use rates, Burning, On-site investigations, Plant populations.
Identifiers: *Trampling, Rhvnchospora alba, Wales, *Peat bogs.

By following the progress of two sets of footprints on Cors Fochno, a raised peat bog on the west coast of Wales, data were obtained to show that over 60% of the annual damage to the site occurs in a few weeks around Easter and is caused by only 40% of the annual number of visitors. The total yearly displacement caused by the trampling of 1890 visitors on the bog's surface is some 4228 cu m, each constituent print of which takes between 20 and 30 months to disappear. It is suggested that Rhynchospora alba is a plant responsive to trampling and that its increased growth might, at least in part, encourage the spread of fires on to the bog. (Katz)
W77-07139

RED TIDE IN THE UPWELLING REGION OF BAJA CALIFORNIA,
Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
D. Blasco.
Limnology and Oceanography, Vol. 22, No. 2, p 255-263, March 1977. 5 fig, 3 tab, NSF GX-33502, GB-18568.

Descriptors: *Red tide, *Dinoflagellates, *Upwelling, Chlorophyll, Carbon, Salinity, Temperature, Water temperature, Phytoplankton, Copepods, Aquatic life, Coasts, Currents(Water), Oceans, Oceanography, Marine biology, *Mexico, Pacific Ocean.
Identifiers: *Baja California.

Predominant organisms in a red water dinoflagellate bloom during the seasonal onset of coastal upwelling off Baja California were Gonyaulax polyedra, Ceratium furca, and Gymnodinium sp. The major part of the chlorophyll and the 14C assimilation in the area were related to the G. polyedra population. The maximum concentration of these organisms was associated with low salinity water of the surface California Current. The dinoflagellates remained in the area during the 20-day cruise, although the vertical stability coefficient was low, with no steep temperature gradient. The high concentrations of small copepods suggest them as major grazers of G. polyedra. (Sims-ISWS)
W77-07169

THE ECOLOGICAL CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART I: ECOLOGICAL STUDIES,
Maine State Dept. of Marine Resources, Augusta.
R. L. Dow, and J. W. Hurst, Jr.
Marine Pollution Bulletin, Vol. 16(11), 1975, p. 164-166, 6 ref.

Descriptors: *Maine, *Oil pollution, *Oil spills, *Mortalities, Fishkills, *Clams, Mollusks, Water pollution effects, *Commercial shellfish, Marine animals, Marine fisheries, *Aquiculture, *Toxicity, On-site investigation, Sediments, Surveys, Ecology, Estuaries.
Identifiers: *Long Cove(Maine), *Ecological studies, *Soft clam, Mya arenaria, *Commercial clam beds, Biological surveys.

An oil spill into Long Cove, Searsport, Maine, began on 16 March and lasted until at least 30 June 1971. It resulted in immediate and continuing soft clam mortalities which, based on before and after biological surveys, had by August 1974 exceeded 85% of the estimated 50 million market-size clams occupying the area. (See W77-07179 and W77-07180) (Katz)
W77-07178

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART II. CHEMICAL STUDIES,
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
D. W. Mayo, C. G. Cogger, and D. J. Donovan.
Marine Pollution Bulletin, Vol. 6(11), 1975, p. 166-171. 2 tab., 3 fig., 2 ref.

Descriptors: *Oil spill, *Oil pollution, Methodology, *Gas chromatography, *Analytical techniques, *Sediments, *Maine, Path of pollutants, *Clams, Animal pathology, Molluscs.
Identifiers: *Soft clams, Mya arenaria, *Gonad tumors, *Petroleum hydrocarbons, Hydrocarbon concentration, Long Cove, Maine, *Number 2 fuel oil, *JP5 jet fuel.

The oil from the March 1971 spill in Long Cove, Searsport, Maine, was identified with the aid of adjacent tank farm samples to be No. 2 fuel oil mixed with JP5 jet fuel. Sediment samples obtained from animal collection sites were analyzed by gas chromatographic procedures and were found to contain significant quantities of petroleum hydrocarbons. (See W77-07178 and W77-07180) (Katz)
W77-07179

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART III: HISTOPATHOLOGICAL STUDIES,
National Water Quality Lab., West Kingston, R. I.
M. Barry, and P. P. Yevich.
Marine Pollution Bulletin, Vol. 6(11), 1975, 171-173, 1 tab., 5 fig., 2 ref.

Descriptors: *Maine, *Oil spill, *Water pollution effects, *Toxicity, *Mortality, Animal diseases, *Animal pathology, *Oil pollution, *Clams, Commercial shellfish, Path of pollutants, Toxicity, Laboratory tests.
Identifiers: *Histopathology, *Gonadal tumours, Malignant neoplasms, Soft clams, Mya arenaria, Microscopic examination.

In July 1971 when approximately 25% of the clams in Long Cove, Searsport, Maine, had been killed by the March 1971 oil spill, collections of surviving clams for histological examination were made. These studies were continued through 1974 and revealed a high incidence of gonadal tumours in clams contaminated by the oil. The area of highest oil impact correlated with the highest per cent of tumours. The tumours were found to be malignant neoplasms. (See W77-07178 and W77-07179) (Katz)
W77-07180

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS I. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIERS FOR SOME MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
H. Tokuda, and S. Arasaki.
Bulletin of the Japanese Society of Scientific Fisheries Vol. 43(1), p. 97-102, 1977. 5 tab., 8 ref.

Descriptors: *Oil pollution, *Oil spills, *Emulsifiers, *Surfactants, Water pollution effects, Path of pollutants, *Toxicity, Mortality,

*Marine algae, *Phytoplankton, Bioassay, Biochemistry, Laboratory tests, Growth rates, Bioindicators, *Lethal limit.
Identifiers: *Skeletonema costatum, *Nitzschia closterium, *Chlamydomonas sp., Anti-alga spectrum.

The lethal concentrations of 84 commercially produced oil-spill emulsifiers for marine phytoplankton were determined by culture experiments. The samples of oil-spill emulsifiers were collected in August of 1971 (54 domestic and foreign products), 1973 (12 domestic products, 1974 (14 domestic products) and 1975 (4 foreign products). Among 3 species of phytoplankton used as test oganisms, Skeletonema costatum was the most sensitive, Nitzschia closterium moderately sensitive, and Chlamydononas sp. the least sensitive to the toxicity of oil-spill emulsifiers. The toxicity of oil-spill emulsifiers was reduced year after year due to the improvements in their components. The most recently produced oil-spill emulsifiers did not inhibit the growth of Skeletonema costatum at a concentration of 100 ppm; moreover, some of them allowed the growth of this alga even at a concentration of 10,000 ppm. (See also W77-07182) (Katz)
W77-07181

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-II. LETHAL CONCENTRATIONS OF OIL-SPILL EMULSIFIER COMPONENTS FOR MARINE PHYTOPLANKTON, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
H. Tokuda.
Bulletin of the Japanese Society of Scientific Fisheries Vol. 43(1), p. 103-106, 1977. 3 tab., 7 ref.

Descriptors: *Oil pollution, *Oil spills, *Emulsifiers, *Surfactants, Water pollution effects, Path of pollutants, Toxicity, Mortality, *Marine algae, *Phytoplankton, *Bioassay, Biochemistry, Laboratory tests.
Identifiers: *Aromatic content, Ester type surfactants, Hydrophobic groups.

The lethal concentrations of solvents (9 samples) non-ionic surfactants (16 samples) used as oil-spill emulsifiers were determined fo two species of marine phytoplankton by culture experiments. Of the test organisms used, Skeletonema costatum was ten times more sensitive than Nitzschia closterium to most of the samples. The toxicity of petroleum solvents was dependent on their aromatic content. The surfactants with hydrophobic groups such as alkyl phenol and secondary alcohol were highly toxic. The ester type surfactants were less toxic than the ether type ones. Also there is some relation between the toxicity and the HLB of non-ionic surfactants. (See also W77-07181) (Katz)
W77-07182

EGG AND LARVAL SURVIVAL OF WHITE SUCKERS (CATOSTOMUS COMMERSONI) AT LOW PH,
Cornell Univ., Ithaca. N.Y. Dept. of Natural Resources.
J. R. Trojnar.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 262-266, 1977. 1 tab., 17 ref.

Descriptors: *Suckers, *Fish eggs, Conductivity, *Hydrogen ion concentration, *Embryonic growth stage, Juvenile fish, Fish physiology, *Acidic water, Mode of Action, *Water pollution effects, *Toxicity, Mortality, Laboratory tests, Bioassay, New York.
Identifiers: *White suckers, Catostomus commersoni, Prolarvae, Acid rains, Abnormalities, Acid lakes, Adirondack mountains.

White sucker (Catostomus commersoni) eggs were incubated in water of high (250 umhos/cm) and low (20 umhos/cm) conductivity with nominal pH ranging from 4.2 to 8.0. At pH 4.5 and below in water of low conductivity no eggs survived to hatching. In high conductivity water at pH 4.5, a few prolarvae hatched but were deformed and soon died. At pH 5.0 and above the total hatch was the same at either conductivity level. However, at pH 5.0 there were body deformities and abnormalities in the vascular system and none of the prolarvae survived to the swim-up stage. At both conductivity levels there was a reduction in swim-up at pH 5.3 compared with the control, but none at pH 5.8. Low pH had a delaying influence on the absorption of the yolk sac. (Katz)
W77-07184

THE DISTRIBUTION AND ECOLOGY OF COMMON MARINE AND ESTUARINE GASTROPODS IN THE DELAWARE BAY AREA,
Delaware Univ., Lewes. Marine Studies Complex.
W. Leathem, and D. Maurer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 302, Price code: A02 in paper copy. The Nautilus, Vol. 89, No. 3, p. 73-79, 1975. 47 ref.

Descriptors: *Gastropods, *Mollusks, *Invertebrates, Distribution Patterns, Aquatic life, Aquatic animals, Estuaries, Systematics, *Benthos, *Classification, Benthic fauna, Ecological distribution, *Delaware Bay, Bays.

A number of taxonomic surveys were conducted in the Delaware Bay area, primarily focusing on the benthic ecology. a synthesis is presented of results from surveys on the distribution and ecology of gastropods in the Delaware Bay region. There were 46 common species of marine and estuarine gastropods, the majority being euryhaline marine species. A few of the species had scattered occurrences in either the true estuarine or stenohaline marine ranges. (Katz)
W77-07185

PREFERRED, AVOIDED, AND LETHAL TEMPERATURES OF FISH DURING RISING TEMPERATURE CONDITIONS,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Biology.
D. S. Cherry, K. L. Dickson, Jr., and J. R. Stauffer.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 239-246, 1977. 1 fig., 3 tab., 23 ref.

Descriptors: *Water temperatures, *Salmonids, *Thermal pollution, *Water pollution effects, Freshwater fish, Perches, Shiners, Sunfishes, Laboratory tests, Statistics, Lethal limit, *Fish behavior, *Fish physiology, *Thermal stress, Thermal water.
Identifiers: Acclimation, *Preferred temperatures, *Avoidance response.

Selected temperatures increased for 15 fish species in a laboratory gradient when acclimated to 3 degree C increments from 12 to 27 degrees C. Temperature preferences exceeded acclimation temperatures between 12 to 27 degrees C for all except the telescope shiner (Notropis telescopus), yellow perch (Perca flavescens), rainbow trout (Salmo gairdneri), brown trout (Salmo trutta), and brook trout (Salvelinus fontinalis). At 30, 33, or 36 degrees C acclimation, preferred temperatures were less than the acclimation temperature. The highest temperature preferences occurred at acclimations of 27, 30, or 33 degrees C. Final temperature preferences were usually greater than 29 degrees C for most centrarchids, above 24 degrees C for most cyprinids, and less than 19 degrees C for salmonids. Avoidance temperatures increased as acclimation temperature increased. Upper avoidances tested at high acclimation temperatures (30-36 degrees C) either equalled or exceeded the 7-day upper lethal temperature limit of the species by 1-2 degrees C, while avoidances were below this upper lethal limit when tested at the acclimation temperature closest to the species' final temperature preference. (Katz)
W77-07186

RESIDUES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) UNDETECTED IN LAKE TROUT AND CHINOOK SALMON FROM THE UPPER GREAT LAKES,
Fish and Wildlife Service, Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 5A.
W77-07187

LABORATORY APPARATUS FOR PROVIDING DIEL TEMPERATURE REGIMES FOR AQUATIC ANIMALS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
W. A. Wurtsbaugh, and G. E. Davis.
The Progressive Fish-Culturist, Vol. 38, No. 4, p. 198-199, 1976. 1 fig., 3 ref.

Descriptors: *Laboratory equipment, *Water temperature, *Fluctuations, *Diurnal, Laboratory tests, Heated water, Temperature control, Aquaria, Trout, Methodology, Thermal pollution.
Identifiers: *Diel temperature fluctuations.

An easy to use, moderate cost apparatus for the study of effects of diel temperature fluctuations on aquatic organisms was constructed with plywood headboxes, immersion heaters, solenoid valves, timers and insulated aquaria. Warm and cool water flows overlap to avoid abrupt temperature changes. (Katz)
W77-07188

HEINZ BODY HEMOLYTIC ANEMIA IN COHO SALMON (ONCORHYNCHUS KISUTCH) EXPOSED TO CHLORINATED WASTEWATER,
Municipality of Metropolitan Seattle, Wash. Water Quality Lab.
J. A. Buckley.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p. 215-224, 3 tab., 11 fig., 46 ref.

Descriptors: *Bioassay, *Chlorine, *Chlorination, *Sewage, Domestic wastes, *Salmon, Fish diseases, Fish physiology, *Pathology, *Effluents, Methodology, Water quality, *Water pollution effects.
Identifiers: *Hematology, *Fish blood cells, *Heinz body hemolytic anemia, *Coho salmon, *Chlorinated wastewater, Total residual chlorine, Erythrocytes, Pathological erythrocytes, Hemoglobin, *Hematologic changes.

Fingerling coho salmon (Oncorhynchus kisutch) were exposed for 12 wk to various concentrations of treated wastewater containing total residual chlorine (TRCl2) with riverwater diluent under continuous flow conditions. Levels of TRCl1 averaging 0.003-0.05 mg/l resulted in mild to pronounced symptoms of hemolytic anemia, including an increase in numbers of circulating immature erythrocytes, pathological changes in erythrocytes, and a reduction in packed cell volume and hemoglobin levels. In addition, Heinz bodies were formed at the 0.012 and 0.05 mg/l TRCl1 levels. The hematologic changes were attributed to the oxidative nature of TRCl. (Katz)
W77-07189

ACUTE TOXICITY OF ZINC, CADMIUM, AND CHROMIUM TO THE MARINE FISHES, YELLOW-EYE MULLET (ALDRICHETTA FORSTERI C. AND V.) AND SMALL MOUTHED HARDYHEAD (ATHERINASOMA MICROSTOMA WHITLEY),
Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.
D. S. Negilski.
Australian Journal of Marine and Freshwater Research, Vol. 27 (1976), p. 137-149, 3 tab., 31 ref.

Descriptors: *Metals, *Toxicity, Mortality, *Bioassay, Laboratory tests, *Marine fish, *Zinc, *Cadmium, *Chromium, *Juvenile fish, Estuarine fish, Fish, Water pollution effects, Industrial wastes, *Water temperature, *Australia.
Identifiers: LC50, Yellow-eye mullet, Smallmouth hardyhead, *Zinc chloride, *Cadmium chloride, *Incipient lethal level, Static bioassay, Continuous flow bioassay.

In static tests with juvenile mullet, the acute incipient lethal level for zinc was 9 mg/l, the 168-h LC50 value for cadmium was 16 mg/l, and the 96-h LC50 values for tri- and hexavalent chromium were 53 and 24 mg/l respectively; in similar tests with pre-adult hardyhead, the acute incipient lethal level for zinc was 33 mg/l and the 168-h LC50 value for cadmium was 21 mg/l. In continuous-flow tests with mullet the acute incipient lethal level for zinc was 12 mg/l, but incipient lethal levels were not attained for cadmium or chromium; however, the 120-h LC50 value for cadmium and the 96-h LC50 value for hexavalent chromium were 14 and 31 mg/l respectively. In similar tests with hardyhead, incipient lethal levels for zinc and chromium were 37 and 36 mg/l respectively. An acute incipient lethal level for cadmium was not attained, but the 168-h LC50 value was 15 mg/l. Generally, mullet and hardyhead were more sensitive to the acute effects of cadmium, chromium and zinc than other marine and estuarine fishes for which toxicological information is available. Increased temperature also appeared to increase the sensitivity of mullet to the lethal effects of zinc. (Katz)
W77-07190

EVALUATION OF TOXICITY TO THE EARLY ONTOGENY OF FISHES OF SUBSTANCES DISCHARGED INTO A BODY OF WATER,
Moscow State Univ. (USSR). Lab. of Water Toxicology.
O. P. Danil'chenko, and N. S. Stroganov.
Journal of Ichthyology, Vol. 15(2), p. 311-319, 1975. 4 fig., 6 tab., 11 ref.

Descriptors: *Chemicals, Chemical wastes, *Water pollution effects, Water quality, *Toxicity, Mortality, Freshwater fish, Juvenile fish, Fry, Fish eggs, Embryonic growth states, *Fish physiology, Laboratory tests, *Bioassay, Biochemistry, *Zinc, *Lead, Metals.
Identifiers: Antiseptics, Development, *Salicylanilide, *Tetraethyl lead chloride, *Sodium pentachlorophenol.

The effect of a number of antiseptics on the embryonic and early post-embryonic development of the following freshwater teleost fishes is investigated: the pike Esox lucius, the perch Perca fluviatilis, the ruffe Acerina cernua, the roach Rutilus rutilus, the minnow Phoxinus phoxinus, the gudgeon Gobio gobio, the leach Misgurnus fossilis and the spiny loach Cobitis taenia. The degree of toxicity of the substances is assessed from their influence on the early development of these fishes. (Katz)
W77-07191

INSTREAM FLOW REGIMENS FOR FISH, WILDLIFE, RECREATION AND RELATED ENVIRONMENTAL RESOURCES,
Fish and Wildlife Service, Billings, Mont.
D. L. Tennant.
Fisheries, vol. 1, no. 4, p. 6-10, 1976. 6 fig., 2 tab., 5 ref.

Descriptors: *Methodology, Aquatic life, Flow, *Average flow, *Streamflow, Bioassay, Biomass, Water quality, Fisheries, Testing, *Stream fisheries, Environmental effects, *Water management(Applied), *Water allocation(Policy), Water distribution(Applied).
Identifiers: *Instream flow regimens.

A quick, easy methodology was described for determining flows to protect the aquatic resources in both warm water and cold water streams, based on their average flow. Detailed field studies were conducted on 11 streams in 3 states between 1964-1974, testing the 'Montana Method.' This work involved physical, chemical, and biological analysis of 38 different flows at 58 crosssections on 196 stream-miles, affecting both cold and warm water fisheries. The studies revealed that the condition of the aquatic habitat was similar on most of the streams carrying the same portion of the average flow. Ten percent of the average flow was a minimum instantaneous flow recommended to sustain short-term survival habitat for most aquatic life forms. Thirty percent was recommended as a basic flow to sustain good survival conditons for most aquatic life forms and general recreation. 60% provided excellent habitat for most life forms during their primary periods of growth and for the majority of recreational uses. (Katz)
W77-07192

DIPHENAMID REMOVAL FROM WATER AND METABOLISM BY AQUATIC PLANTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.
S. W. Bingham, and R. L. Shaver.
Pesticide Biochemistry and Physiology, vol. 7, p. 8-15, 1977. 9 fig., 23 ref.

Descriptors: *Organic compounds, *Biochemistry, *Algae, *Pesticides, *Metabolism, *Plant physiology, *Aquatic plants, Pondweeds, Water hyacinth, Path of pollutants, Mode of action, Analytical techniques, Water quality.
Identifiers: *Diphenamid, Parrotfeather, White algae, Bioaccumulation, Myriophyllum brasilience, Eichornis crossiper, Ulothrix sp., Oedogonium sp., Glococystis sp., Scenedesmus sp., Potamogeton diversifolius.

Several aquatic plants were effective for removal of N,N-dimethyl-2, 2-diphenyl-acetamide ((14C-) diphenamid) from water and degradation to various metabolites. Parrotfeather (Myriophyllum brasilience L.) and water hyacinth (Eichornis crossiper L.) removed large quantities of diphenamid from water while algae (Ulothrix sp., Oedogonium sp., Glococystis sp., and Scenedesmus sp. mixed culture) and waterthread pondweed (Potamogeton diversifolius Raf.) were less effective in reducing diphenamid concentration in the water. A somewhat stable metabolite in algae, water hyacinth , and parrotfeather was N-methyl-2,2-diphenyl-acetamide. Algae and water hyacinth degraded diphenamid further to unknown products. One of these compounds moved more slowly than N-methyl-2,2-diphenylacetamide on thin-layer chromatography using benzene, n-heptane saturated with water and methanol solvent. While most solvents did not resolve 2,2-diphenylacetic acid from the base, petroleum ether, ethyl ether, and formic acid (50:50:2, v/v/v) was found to move 2,2-diphenylacetic acid further than diphenamid or N-methyl-2,2-diphenylacetamide on thin-layer chromatography. (Katz)
W77-07193

HEAVY METAL POLLUTION IN TRONDHEIMSFJORDEN, NORWAY, AND THE RECORDED EFFECTS ON THE FAUNA AND FLORA,
Kongelige Norske Videnskabers Selskab, Trondheim. Museet.
E. Lande.
Environmental Pollution, vol. 12, p. 187-198, 1976. 1 fig., 3 tab., 17 ref.

Descriptors: *Metals, *Sampling, *Wildlife, *Invertebrates, *Algae, *Birds, *Path of pollutants, Environmental effects, Bioassay, *Cadmium, *Copper, *Iron, *Nickel, *Chromium, *Silver, *Zinc, *Mercury, Analytical techniques, Water pollution sources, Water quality.
Identifiers: *Tissue analysis, *Bioaccumulation.

The extent of heavy metal pollution in Trondheimsfjorden was investigated throughout the period of 1972-73. Samples of invertebrates and seaweeds from the intertidal zone were collected for analysis, and parts of some pelagic and bottom-dwelling fishes were also sampled. Seabirds were collected in the fjord and from adjacent areas. Subsamples from the kidneys, liver, pectoral musculature and eggs (white and yolk) of these birds were analysed. All samples were analysed for cadmium, copper, iron, nickel, chromium, silver, zinc and mercury. Heavy metal pollution was found in two distinct areas of the fjord. The qualitative and quantitative changes in the faunal assemblages of these two areas were described. (Katz)
W77-07194

OFFSHORE OIL AND FISHERY RESOURCES,
New York State Dept. of Environmental Conservation, Delmar. Div. of Marine and Coastal Resources.
A. C. Jensen.
New York Fish and Game Journal, vol. 23, no. 2, p. 138-148, 1976. 1 fig., 2 tab., 27 ref.

Descriptors: *Commercial fishing, *Commercial shellfish, *Shellfish, *Environmental effects, *Oil wastes, Natural resources, *New York, *Oil industry, *Drilling, *Risks, *Fishkill, Marine fisheries, Fisheries, Clams, Oysters, Water pollution effects.
Identifiers: *Offshore oil, Risk potential.

The prospect of petroleum reserves off New York and adjacent states has focused a detailed look at the living marine resources of the area as they might be affected by drilling for the petroleum and by possible oil spills. The volume and value of the harvested portions of the resources and their socio-economic impact are discussed. The information is presented as an aid to the decision-makers who must evaluate the known fishery resources against the unknown petroleum resources. (Katz)
W77-07195

THE RELATIONSHIP BETWEEN CUPRIC ION ACTIVITY AND THE TOXICITY OF COPPER TO PHYTOPLANKTON,
Woods Hole Oceanographic Institution, Mass.
W. Sunda, and R. R. L. Guillard.
Journal of Marine Research, vol. 34, no. 4, p. 511-529, 1976. 2 tab., 8 fig., 25 ref.

Descriptors: *Hydrogen ion concentration, *Diatoms, *Copper, *Growth rate, *Inhibitors, *Chelation, *Algae, *Water chemistry, *Phytoplankton, *Toxicity, *Nutrient requirements, *Ions, Laboratory tests, Primary productivity, Estuaries.
Identifiers: Thalassiosira, Nannochloris.

Culture experiments with the estuarine diatom Thalassiosira pseudonana in highly chelated seawater media demonstrate that growth rate inhibition and copper content of cells are related to cupric ion activity and not to total copper concentration. Cupric ion activity was altered independently of total copper concentration by varying the chelator concentration and the pH. Cellular copper content of 3 to 4 day old cultures followed a hyperbolic relation with cupric ion activity. Copper inhibited growth rate at activities above 3 x 10 to the 11th power M and growth ceased at values above 5 x 10 to the 9th power M. The relation between growth rate inhibition and cupric ion activity was not a simple hyperbolic function. In experiments with the green alga, Nannochloris atomus, growth rate inhibition also was related to cupric ion activity with partial growth rate inhibition occurring in the activity range 4 x 10 to the 11th power to 2 x 10 to the 9th power M. Calculated estimates of cupric ion activity in seawater indicate that natural activi-

ty levels can be inhibitory to these phytoplankton depending on pH and the degree of copper complexation by natural organic ligands. (Katz)
W77-07196

RESPONSES OF THE LICHENS PELTIGERA APHTHOSA AND CETRARIA NIVALIS AND THE ALGA NOSTOC COMMUNE TO SULFUR DIOXIDE, NATURAL GAS, AND CRUDE OIL IN ARCTIC ALASKA,
Louisville Univ., Dept. of Biology.
R. M. Atlas, and E. Schofield.
Astarte, vol. 8, no. 2, p. 53-60, 1976. 7 fig., 1 tab., 17 ref.

Descriptors: *Alaska, *Arctic, *Nitrogen fixation, *Carbon dioxide, *Inhibitors, Sulfur compounds, *Oxygen, *Respiration, *Oil wastes, *Oil, *Algae, *Lichens, Carbon cycle, Photosynthesis, Environmental effects, On-site investigations, Bays.
Identifiers: *Crude oil, *Peltigera, *Cetraria, *Nostoc, Prudhoe Bay(Alas).

The sensitivity of the Arctic populations of the lichens Peltigera aphthosa and Cetraria nivalis and the alga Nostoc commune to three pollutants was determined by measuring rates of nitrogen fixation, carbon dioxide fixation and oxygen consumption. Sulfur dioxide was most inhibitory to carbon dioxide fixation, but did not inhibit oxygen consumption. Prudhoe crude oil severely inhibited both nitrogen and carbon dioxide fixation. Natural gas has a much lesser effect on the test organisms. Lichens appeared to be less sensitive to the pollutants than were the free alga. (Katz)
W77-07197

UPTAKE AND ACCUMULATION OF THE NICKEL ION BY MYTILUS EDULIS,
San Francisco Univ., Calif. Dept. of Biology.
A. R. Friedrich, and F. P. Filice.
Bulletin of Environmental Contamination and Toxicology, vol. 16, no. 6, p. 750-755, 1976. 4 fig., 11 ref.

Descriptors: *Nickel, *Mussels, *Absorption, *Heavy metals, Industrial wastes, Mollusks, Bioindicators, Bioassay, Water pollution effects, *Path of pollutants, Toxicity, Animal physiology.
Identifiers: Bivalves.

Mussels (Mytilus edulis) were exposed to nickel concentrations of 0.018, 0.030, 0.056, and 0.107 mg/l for 1, 2, 3 and 4 weeks. Uptake and accumulation were significant at the two highest concentrations. Another experiment showed significant uptake and accumulation at concentrations of 20, 40 and 80 mg Ni/l after a 96 hour exposure. Byssal threads were secreted only at 20 mg Ni/l. (Katz)
W77-07198

SUBTIDAL AND INTERTIDAL MARINE FOULING ON ARTIFICIAL SUBSTRATA IN NORTHERN PUGET SOUND, WASHINGTON,
Washington Univ., Seattle. Coll. of Fisheries.
C. H. Hanson, and J. Bell.
Fishery Bulletin, Vol. 74, No. 2, p. 387-402, 1976. 5 fig., 1 tab., 25 ref.

Descriptors: *Cooling waters, *Marine animals, *Power plants, Locating, Sites, *Biological communities, Artificial substrates, Invertebrates, Marine algae, On-site investigations, Seasonal, Depth, *Heavy metals, *Washington.
Identifiers: *Marine fouling, Fouling organisms, Copper-nickel alloy, *Puget Sound(Wash).

The design and siting of power plant cooling systems requires detailed information concerning the fouling tendencies of specific organisms on specific construction materials. This study, conducted in the vicinity of Kiket Island, northern Puet Sound, Wash., attempts to provide some of this information. The sessile community characteristics of five materials exposed at three depths and two locations in the subtidal zone, and of one material in the intertidal zone are described. The degree of biofouling was least for copper-nickel alloy and progressively greater for Plexiglas, wood, steel, and concrete. Media decay and biological accumulation was greatest at the near-surface level, decreasing in intensity with increasing depth. The maximum rate of colonization occurred during the late spring (April-June) and early fall (mid-August-October). The present study, an analysis of biofouling, indicates that if the proposed power plant were to be built at Kiket Island, its cooling system intake should be sited in water deeper than 6 m and should have a safe and adequate fouling control scheme. (Katz)
W77-07201

UPTAKE, DISTRIBUTION, AND DEPURATION OF 14C-BENZENE IN NORTHERN ANCHOVY, ENGRAULIS MORDAX, AND STRIPED BASS, MORONE SAXATILIS,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Lab.
S. Korn, N. Hirsch, and J. W. Struhsaker.
Fishery Bulletin, Vol. 74, No. 3, p. 545-552, 1976. 2 fig., 4 tab., 13 ref.

Descriptors: *Marine fish, *Oil pollution, *Path of pollutants, Commercial fish, *Bass, Juvenile fish, Oily water, Water pollution effects, Toxicity, *Absorption, Laboratory tests, Carbon radioisotopes, Fish physiology.
Identifiers: *Benzene, *Northern anchovy, Engraulis mordax, Morone saxatilis, Sub-lethal concentrations, *Bioaccumulation, Tissue samples, Depuration, *Striped bass.

The uptake, distribution, and depuration of water-soluble, monocyclic hydrocarbon contained in petroleum and refined products was studied in two species of marine fish. Mature northern anchovy, Engraulis mordax, and juvenile striped bass, Morone saxatilis, were exposed to sublethal concentrations of 14C-benzene for 48 h. Residues in tissues exhibiting a high lipid content or representing apparent major metabolic sites were measured during the exposure and afterwards when the fish were transferred to clean seawater. Fish exhibited a rapid uptake over a wide range of benzene concentrations in the water column. Accumulation in anchovy was considerably greater than in striped bass. Results indicate that the pathway of hydrocarbons through the liver, gallbladder, intestines, and colon is a major depuration route. Residues were depurated rapidly after cessation of exposure; in striped bass tissues most residues were undetectable by 7 days. (Katz)
W77-07202

ENVIRONMENTAL DEPENDENCE OF MANGANESE AND ZINC IN THE SCALES OF ATLANTIC SALMON, SALMO SALAR (L) AND BROWN TROUT, SALMO TRUTTA (L),
Liverpool Univ. (England). Dept. of Oceanography.
M. I. Abdullah, J. W. Banks, D. L. Miles, and K. T. O'Grady.
Freshwater Biology, Vol. 6, No. 2, p. 161-166, 1976. 3 fig., 2 tab., 11 ref.

Descriptors: *Salmonids, *Atlantic salmon, *Brown trout, *Zinc, *Manganese, *Path of pollutants, Freshwater fish, Smolts, Juvenile fish, Heavy metals, Water pollution effects, Absorption, Water chemistry, Biochemistry.
Identifiers: Fish scales.

Analysis of manganese and zinc concentrations in the scales of salmon and trout from a number of sites showed significant dependence of the levels of these metals in the scales on the levels in the environment. There is some evidence to suggest that in trout scales there is a minimum concentration of zinc above which there is a direct proportion between environmental and scale concentration. It is also possible that the response of trout to environmental zinc differs from that of salmon. (Katz)
W77-07203

APPARENT POTENTIATION OF THE COTTON DEFOLIANT DEF BY METHYL PARATHION IN MOSQUITOFISH,
Mississippi Univ. for Women, Columbus. Dept. of Biology.
D. L. Fabacher, J. D. Davis, and D. A. Fabacher.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 6, p. 716-718, 1976. 1 tab., 3 ref.

Descriptors: *Defoliants, *Insecticides, *Toxicity, *Agricultural chemicals, Water pollution, Water pollution effects, Water pollution sources, Mortality, Laboratory tests, Freshwater fish, Bioassay.
Identifiers: 24 hr. LC50, *Mosquitofish, Gambusia affinis, 48 hr. LC50, *Methyl parathion, Potentiation, Cotton defoliant.

Mosquitofish were treated with 0.5 ppm DEF (a cotton defoliant), 5 ppm methyl parathion (boll weevil insecticide) and a combination of 0.5 ppm DEF and 5 ppm methyl parathion. The observed mortalities were 0%, 8% and 89% respectively. This potentiation or greater-than-additive toxicity effect should be considered when both DEF and methyl parathion are sprayed on the cotton fields. (Katz)
W77-07204

PLANKTONIC INFUSORIA IN TWO LAKES OF THE GORKI OBLAST, (IN RUSSIAN),
Gorkii State Univ. (USSR).
M. A. Petrova, T. P. Smirnova, T. A. Ageeva, and G. V. Khalturina.
Gidrobiol Zh 12(2), p 31-36, 1976.

Descriptors: Lakes, *Biomass, Plankton, *Productivity, *Zooplankton, Water temperature.
Identifiers: *Gorki lakes region(USSR), *Planktonic, Infusoria, USSR.

Data on the number, biomass, generation time and production of plankton infusoria are presented for 2 different lakes in the Gorky Region (Russian SFSR, USSR), Lakes Velikoe and Svjatoe. Differences in species composition and the relative role of infusoria in the zooplankton biomass in both lakes (4.3 and 10.1%, respectively) are given. Biomass and production were similar in the 2 lakes. The propagation rate is high and depends on water temperature.--Copyright 1976, Biological Abstracts, Inc.
W77-07234

WATER QUALITY AND CHEMICAL MODELS,
Harvard Univ., Boston, Mass. Div. of Engineering and Applied Physics.
J. N. Butler.
Environmental Affairs, Vol. 2, No. 2, p. 382-98 (Fall 1972). 1 fig, 1 tab.

Descriptors: *Lakes, *Model studies, *Eutrophication, *Analytical techniques, Theoretical analysis, Aquatic algae, Biochemical oxygen demand, Fishkill, Lake stages, Oxygen requirements, Oxygen, Water quality, Odor-producing algae, Algal toxins, Aquatic life, Cyanophyta, Algal control, Evaluation.
Identifiers: Algal blooms.

A model is any representation of a real system which is easier to manipulate than the real system itself. The more complete and relevant one's mental model of an environmental situation is, the better the decisions will be regarding that situation. A chemical model is one which depends on a detailed understanding of the various factors which may affect a given use for water. The use discussed here is the recreational use of an urban lake. The essential quality parameters are that

swimmers should not contract disease or be poisoned, and that visibility be sufficient to allow rescue of those likely to drown. The most serious problem faced is overfertilization (eutrophication). This can be both an aesthetic nuisance and a cause of fish kill. The key questions are: What important factors cause eutrophication. How many algal blooms be controlld. How may the extent of algal growth be predicted. Approaching these questions from a chemical viewpoint, one is able to propose solutions to correct the problems, yet keep the resource within the purpose intended. It is in this fashion that using a chemical model seems most beneficial. (Moorhouse-Florida)
W77-07246

THE DIFFERENTIAL USE OF CHIRONOMIDAE AND CERATOPOGONIDAE (DIPTERA) IN THE MONITORING OF VARIOUS AQUATIC WASTES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Entomology.
For primary bibliographic entry see Field 5A.
W77-07282

FATE OF THE ORGANOPHOSPHATE INSECTICIDE PARATHION IN THE FRESHWATER INVERTEBRATES,
Rhode Island Univ., Kingston. Dept. of Pharmacology and Toxicology.
G. P. Carlson, and G. C. Fuller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 711, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, (1976). 16 p, 2 tab, 43 ref. OWRT A-060-RI(1). 14-34-0001-6041.

Descriptors: *Invertebrates, *Insecticides, *Crayfish, *Snails, *Toxicity, *Pesticide residues, Absorption, Metabolism, Water pollution effects.
Identifiers: *Parathion, Cambarus, Paraoxon, Viviparus malleatus, Metabolites.

The goal was to determine the toxicity and fate of the organophosphate insecticide parathion in the freshwater crayfish Cambarus and snail Viviparus malleatus. The research was designed to measure the toxicity of this pesticide to these species in relation to their ability to take it up, metabolize it to the active metabolite paraoxon and inactive metabolites, principally p-nitrophenol and finally excrete the pesticide and metabolites. The results indicate there seems to be no direct danger to snail due to parathion, but the crayfish is sensitive to parathion at levels so low that they are normally exceeded in ponds adjacent to farms following agricultural spraying with parathion. The direct effect on snails due to parathion spraying is minimal and there appears to be very little accumulation of organophosphate in exposed snail tissues; thus the danger to predator species also appears small. However the consequences of crayfish elimination by organophosphate may be real and need investigation, while accumulation, although being investigated, would not be of importance with toxicity occurring at such a low dose.
W77-07285

ECOLOGICAL STUDIES OF THE BRUSSELS URBAN ECOSYSTEM: CONTRIBUTION 8. FIRST SURVEY OF THE HYDROBIOLOGY OF THE WOLUWE VALLEY IN BRUSSELS, (IN FRENCH),
Brussels Univ. (Belgium). Faculte des Sciences.
J. C. Lamaye.
Bull Soc R Bot Belg 108(2), p 295-314, 1975.

Descriptors: *Ecosystems, *Urbanization, *Eutrophication, *Cyanophyta, *Diatoms, Hydrobiology, Plankton, Ponds, Surveys, Water pollution effects.
Identifiers: *Belgium(Brussels area), *Woluwe River valley(Belgium).

The particular conditions of the Woluwe River, one of the last still flowing through E Brussels (Belgium) were analyzed. A great number of ponds, affected by urban pollution are present in this valley. The chemical conditions and the composition of the planktonic communities were observed during 1 yr in the river and in adjacent ponds. Observations of the annual biocenotic cycle show a progressive eutrophication accompanied by a reduction of the diversity of phytoplankton. Blooming a few species of Cyanophyceae and Diatomeae is characteristic of the hypertrophic ponds.--Copyright 1976, Biological Abstracts, Inc.
W77-07292

STUDY ON RESPIRATORY METABOLISM MODIFICATIONS IN ACARTIA CLAUSI (CRUSTACEA: COPEPODA) POPULATIONS AFTER PASSAGE THROUGH THE COOLING CIRCUIT OF A POWER PLANT,
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Hydrobiologie Marine; and Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
R. Gaudy.
Marine Biology, vol. 39, p. 179-190, 1977. 2 fig., 6 tab., 27 ref.

Descriptors: *Copepods, *Cooling water, *Respiration, Zooplankton, Power plants, Water temperature, *Thermal pollution, Water pollution, Effects, Animal physiology, Metabolism, Thermal stress.
Identifiers: *Acartia clausi, Respiration-temperature curves.

The respiratory metabolism of the copepod Acartia clausi was studied at different temperatures during an annual cycle. Copepods were collected from intake area, the outlet area, where the heated effluents were discharged with an average of 6C, and a small protected bay directly influenced by the flow of the heated waters. Seasonal variations in respiration intensity were observed, with a spring maximum. Specimens collected from the heated effluents exhibited comparatively reduced metabolism. Q10 varied with temperature and time of year, suggesting seasonal regulation of metabolism. Except in March, where metabolic curves differed markedly according to the origin of the sample (species from the heated effluents displaying a metabolic curve of the summer type), the principal difference in shape of the respiration-temperature curves appeared in the range of 10 to 14C, where reduced respiration was observed in specimens from the heated effluents. When A. clausi from external areas were exposed to artificial thermal stress, they displayed a respiratory metabolism pattern similar to that of specimens sampled from the heated effluents. (Katz)
W77-07305

INFLUENCE OF WETTING TENSION AND IONS UPON SETTLEMENT AND BEGINNING OF METAMORPHOSIS IN BRYOZOAN LARVAE (BOWERBANKIA GRACILIS),
Technische Universitaet, Brunswick (West Germany). Zoologisches Institut.
R. Eiben.
Marine Biology, vol. 37, p. 249-254, 1976. 6 fig., 15 ref.

Descriptors: *Larvae, *Growth stages, Life cycles, *Capillary action, *Surface tension, Surfaces, *Mode of action, *Boundaries(Surfaces), Animal physiology, Interfaces, *Salts, *Zooplankton, Chlorides, Animal physiology, Animal behavior, Water quality, Analytical techniques, Potassium compounds, Magnesium compounds, Cesium.
Identifiers: *Bowerbankia gracilis, *Tissue analysis, Wetting solids.

Settlement and metamorphosis in Bowerbankia gracilis larvae were dependent on the wettability of the substratum. The wettability of a solid was characterized by its specific contact angle, Theta. Larvae settled on solids with angles greater than 17 degrees, but not on surfaces with high wettability properties. The rate of settlement and that of metamorphosis were dependent on the degree of Theta in an all-or-none fashion. Settlement of larvae on high-wetting solids was prevented by high capillary pressure accruing at the point of contact. Metamorphosis was initiated by contractions occurring after adhesion. Application of CsCl or KCl induced such contractions and metamorphosis in free-swimming larvae. MgCl2 prevented the onset of metamorphosis but not adhesion. Two mechanisms were considered for induction of metamorphosis: (1) mechanical stimulation by shearing the cilia at the point of contact, and (2) a chemical stimulation of the cell membrane after application of K+ or Cs+. (Katz)
W77-07306

THE OLIGOCHAETE COMMUNITIES OF A LOWLAND STREAM AND THEIR VALUE AS INDICATORS OF ORGANIC POLLUTION,
Bordeaux-1 Univ., Talence (France). Comparative Anatomy Lab.; and Bordeaux-1 Univ., Talence (France). Dept. of Hydrobiology.
F. Gross.
Annales de Limnologie, vol. 12, no. 1, p. 75-87, 1976. 3 fig., 3 tab., 26 ref.

Descriptors: *Biological communities, *Bioindicators, *Agricultural runoff, *Water quality, *Pollutant identification, *Oligochaetes, *Water quality control, Benthos, Benthic fauna, Invertebrates, Water pollution effects.
Identifiers: *Tubifex, *Limnodrilus, Species diversity.

The usual methods used to determine the biological quality of running water are not very precise for the detection of mild pollution due to organic material from agriculture. Under conditions such as this, the following criteria have been used, successfully: (1) the specific diversity of oligochaete populations; (2) the percentage of oligochaetes in the benthos; (3) the importance of the association Tubifex tubifex (M.), Limnodrilus hoffmeisteri (Cl.) and L. udekamanius. (Katz)
W77-07307

EFFECTS OF COMBINATION OF TEMPERATURE AND HYDROSTATIC PRESSURE ON ASTERIAS RUBENS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
H.-G. Neuhoff, and H. Theede.
Kieler Meeresforschungen, Vol 30, No 1, p 32-43, 1975. 4 tab, 5 fig, 30 ref.

Descriptors: *Environmental effects, Animal physiology, *Water temperature, *Hydrostatic pressure, Water pressure, Invertebrates, Enzymes, Zooplankton, Methodology, Laboratory tests, Bioassay, Water pollution effects.
Identifiers: *Asterias, *Starfish.

Small specimens of the starfish Asterias rubens (radius: 5-10 mm) tolerate higher hydrostatic pressures than larger ones (radius: 25-40 mm). Pressure tolerance of this species increases with rising temperature from 5 to 15C. Pressure induced reversible injuries are 'repaired' more quickly at higher temperatures. Irreversible damaged starfishes die more quickly at 15C than at 5C. With decreasing temperature and augmenting hydrostatic pressure the activity of the enzyme Lactate-dehydrogenase of Asterias rubens is increasingly inhibited. (Katz)
W77-07308

INVESTIGATIONS ON THE INFLUENCE OF CRUDE OIL ON SURVIVAL AND OXYGEN CONSUMPTION OF IDOTEA BALTICA AND GAMMARUS SALINUS,
Kiel Univ. (West Germany). Institut fuer Meereskunde.

A. Ponat.
Kieler Meeresforshungen, Vol 31, p 26-31, 1975. 3 fig, 1 tab, 17 ref.

Descriptors: Water pollution effects, *Oil, *Invertebrates, *Crustaceans, *Toxicity, *Respiration, Environmental effects, *Bioassay, *Salinity, Laboratory tests, Oxygen, Oil spills, Water temperature, Animal metabolism.
Identifiers: *Gammarus salinus, *Idotea baltica, *Crude oil, Venezuela crude, Libya crude, Iran crude.

The influence of crude oil from Venezuela, Libya and Iran was observed with respect to Idotea baltica and Gammarus salinus. Prior to the measurements, the animals were spread out on sand and exposed to a 0.1 mm layer of crude oil for four hours. After this period they were transferred back to seawater of 15% salinity at 15C. The mean time of survival for G. salinus varied between one and two days, with the shortest survival in Iran oil and the longest in Venezuelan oil (control value: 31 days). I. baltica showed a greater resistance with a mean survival time of 41 days for Iran oil, 48 days for Venezuelan oil and 51 days for Libya oil (control value: 56 days). At this salinity and temperature, the oxygen consumption of G. salinus was reduced by Iran crude oil to 40% of the normal value and to 70% of the normal value in Idotea. (Katz)
W77-07310

INFLUENCE OF AN OZONISATION PLANT ON THE BACTERIAL CONTENT IN WATER OF A DEMONSTRATION AQUARIUM,
Kiel Univ. (West Germany).
H. Schlesner, and G. Rheinheimer.
Kieler Meeresforschungen, Vol 30, No 2, p 117-129, 1974. 28 fig, 13 ref.

Descriptors: *Water purification, *Ozone, *Bacteria, *Aquaria, *Pollution abatement, *Oxidation, Water treatment, Oxygen, Methodology, Pesticides, Water quality control, Foaming, Aquiculture, Marine bacteria, Nitrogen compounds, Nitrites, Nitrates.
Identifiers: *Ozonation plants.

The purpose was to determine the effect of a sea water purification system on the concentration of bacteria in the aquarium of the Institut fur Meereskunde. Aquarium water differed from that of the Kiel Fjord, especially in its higher phosphate and nitrate concentrations. Saprophyte counts decreased when water was purified and ozone added. The decrease of bacteria was due to increased surface tension of bubbles producing foam which acted as a collecting agent for pollutants as well as bacteria. The amount of ozone was not enough to cause a germicidal effect. Soluble proteins and pollutants were extracted from the water and poisonous nitrite was converted to nitrate by the plant. Additional experiments indicated that a long period of time was necessary for the germicidal action of a given quantity of ozone in polluted aquarium water. The efficiency of the ozone depended on the oxidizable contents of the organic and inorganic matter. (Katz)
W77-07311

COMPARATIVE CHARACTERISTICS OF THE PARASITE FAUNA OF BREAM IN LAKES DUSIOS, OBELIJOS, SALVANTU AND GALSTAS, WHICH HAVE DIFFERENT THERMAL REGIMES, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 2H.
W77-07312

EXPERIMENTAL STUDY OF THE NITROGEN EXCRETION OF BASS (DICENTRARCHUS LABRAX) DURING GROWTH. I. EFFECTS OF TEMPERATURE AND WEIGHT ON THE EXCRETION OF AMMONIA AND UREA,
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
O. Guerin-Ancey.
Aquaculture, Vol 9, p 71-80, 1976. 7 fig, 1 tab, 16 ref.

Descriptors: *Bass, *Juvenile fish, *Water temperature, *Nitrogen compounds, *Ammonia, *Fish physiology, Fry, Weight, Metabolism, *Ureas, Laboratory tests.
Identifiers: Dicentrarchus labrax, Excretion of nitrogen(Bass).

The effects of temperature and body weight on ammonia and urea excretion were examined for fishes acclimated to 12, 14, 16, 18, 20, 22, and 24C. Ammonia and urea excretion rates were very high at the highest temperatures and decreased with decrease in temperature. Between 18 and 24C, ammonia excretion rates were equal while urea excretion rates increased with temperature. The excretion of age groups 0, 1 and 2 was studied; the younger the fishes, the more important were the excretion rates. (Katz)
W77-07313

UPTAKE OF DISSOLVED AMMONIUM AND NITRATE ION BY THE FRY OF COMMON CARP, CRUCIAN CARP AND LOACH FROM SURROUNDING WATER, (IN JAPANESE),
T. Ito.
Bulletin of Freshwater Fisheries Research, Vol 26(1), p 27-33, 1976. 3 fig, 3 tab, 7 ref.

Descriptors: *Ammonia, *Nitrates, *Absorption, Nitrogen compounds, Radioisotopes, Bioassay, Laboratory tests, *Carp, Juvenile fish, Fry, Proteins, Fish physiology, Water pollution effects.
Identifiers: Common carp, Crucian carp, *Loach.

Uptake of ammonium-15N and nitrate-15N from environmental water kept at 23-24.5C was estimated at various concentrations of these substances using carp fry, crucian carp fry and loach fry. 15N was analysed by optical spectrographic method after being converted into nitrogen gas in sealed tube by Dumas' method. All of the fry showed ammonium-15N absorption directly from the water. The rate of 15N-replacement increased exponentially to the concentration of ammonia in the water as well as to the time exposed to labelled ammonia for carp and crucian carp, whereas loach fry absorbed 15N in linear relation and proportially to the concentration in water. 15N was absorbed and no apparent correlation was observed between the rate of replacement and the concentration in water. When the carp fry were returned to water free from labelled ammonia after being exposed for 48 hours, relatively large amounts of 15N were excreted within the first hour, followed by a very slow rate of excretion. More than 50% of absorbed 15N was retained after 48 hours. Appreciable amounts of 15N were found in the fish killed beforehand and exposed likewise to ammonium-15N. The amount, however, was about 1/2 to 1/3 to that of the living carp. (Katz)
W77-07314

PCB CONTENTS IN THE MUSCLE OF MARINE ANIMALS COLLECTED IN THE SEA NEAR HAKODATE (IN JAPANESE),
Hokkaido Univ., Hakodate (Japan). Lab. of Food Hygiene.
M. Takagi, H. Murayama, and S. Soma.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 42(5), p 589-594, 1976. 2 fig, 2 tab, 4 ref.

Descriptors: *Polychlorinated biphenyls, *Path of pollutions, *Absorption, Water pollution, Water pollution effects, Biochemistry, Laboratory tests, On-site data collections, Marine animals, *Chlorinated hydrocarbon pesticides, Pacific Ocean, Public health.
Identifiers: Bioconcentration, Muscle tissue, Fat content.

Concentrations of polychlorinated biphenyls (PCB) were determined in the muscle of 36 species of marine animals collected in the sea near Hakodate in 1973-1975. PCB concentrations in the muscle ranged between 0.01-0.18 ppm, i.e., a maximum value of 0.18 ppm in Tribolodon hakonensis hakonensis, and a minimum value of 0.01 ppm in Osmerus dentex. The muscle PCB contents were high in proportion to the high fat contents in the species of Tribolodon, Sardinops, Trachurus and Pleurogrammus. On the contrary, PCB contents were generally low in proportion to the low fat contents in 26 species of fish. Consequently, the level of PCB concentrations in the muscle of fish in this area was found to be extremely low as compared with that in fish in other polluted areas. (Katz)
W77-07315

THE INFLUENCE OF UNDERWATER EXPLOSION ON FISH, (IN JAPANESE),
For primary bibliographic entry see Field 8H.
W77-07316

PRELIMINARY EXPERIMENT OF COBALT 60 POLLUTION OF A MARINE FOOD CHAIN: RESULTS OF A SINGLE INGESTION,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Departement de Protectione; CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Service de Recherches Toxicologiques et Ecologiques; and CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Laboritorie de Radioecologie Continental.
J.-C. Amiard, and C. Amiard-Triquet.
Water, Air and Soil Pollution, Vol 5(2), p 221-229, 1975. 5 tab, 16 ref.

Descriptors: *Cobalt radioisotopes, *Path of pollutants, *Food chains, *Food webs, *Plankton, *Mollusks, *Crabs, Water pollution, Water pollution effects, Radioactivity effects, Public health, Laboratory tests, Bioassay, Biochemistry.

A large accumulation of Cobalt 60 was observed at the level of the primary producer, Navicula sp. (Concentration factors=266-396). After one feeding on contaminated food the primary consumers (Scrobicularia plana, Mollusca, Lamelli-branchia) and secondary consumers (Carcinus maenas, Crustacea) retained a large portion of the cobalt ingested (80-90%). The literature indicates that mammals retain a smaller fraction of the Cobalt 60 ingested than do the marine organisms studied. (Katz)
W77-07317

NUTRIENT TRANSFORMATIONS IN LOUISIANA SALT MARSH SOILS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
R. D. DeLaune, W. H. Patrick, Jr., and J. M. Brannon.
Sea Grant Publication No LSU-T-76-009, November 1976. Coastal Zone Management Series. 44 p, 19 fig, 4 tab, 59 ref.

Descriptors: *Salt marshes, *Wetlands, *Louisiana, *Nutrients, *Productivity, Soils, Nitrogen, Phosphorus, Coasts, Bays, Seasonal.
Identifiers: Spartina alterniflora, Seasonal variations, Barataria Bay(La), Coastal zone management.

Barataria Bay salt marsh exhibits high productivity. Many chemical and microbiological processes occurring in the marsh directly affect productivity. The soils are more or less permanently saturated or submerged. Seasonal changes in redox potential occur only in the upper 5 cm of the soil profile.

Reduced forms of iron, manganese, nitrogen, and sulfur predominate. The nutrient content of Barataria Bay's organic soils are quite high on a total dry mass basis but can be rather low on a volume basis. Levels of nitrogen are low in the spring when maximum uptake of ammonium by Spartina is occurring. Supplemented nitrogen increased the yield of Spartina by 15%. Not only is productivity increased by added nitrogen, but the content of nitrogen in the plant is also increased. The addition of supplemented phosphorus had no effect on productivity. The phosphorus supply capacity of the soil is high enough to provide an adequate amount for plant growth. (NOAA)
W77-07319

THE EFFECT OF COLLECTOR DISCHARGE WATER FROM RICE FIELDS ON THE ZOOPLANKTON OF SOME KUBAN ESTUARIES, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
S. E. Panchenko, and E. S. Proskurina.
Gidrobiol Zh 9(3), p 73-78, 1973.

Descriptors: Water pollution effects, *Biomass, DDT, DDE, *Chlorinated hydrocarbon pesticides, DDD, Estuaries, *Zooplankton, *Pesticide residues, Path of Pollutants, Rice, Irrigation, *Copepods, *Crustaceans.
Identifiers: Alona-rectangula, Brachionus-angularis, Calanipeda-aquae-dulcis, Chydorus-sphaericus, Cyclops-strenuus, Daphnia-pulex, Diaphanosoma-brachyrum, Diaptomus-gracilis, Euchlanis-dilatata, Eucyclops-serrulatus, Eurytemora-velox, Keratella-quadrata, *Kuban(USSR), Moina-rectirostris, Roach, USSR, Zander.

The composition and population of 13 spp. of Rotifera, Copepoda and Cladocera (Brachionus angularis, Euchlanis dilatata, Eurytemora velox, Cyclops strenuus, Chydorus sphaericus, Moina rectirostris, Daphnia pulex, Calanipeda aquae-dulcis, Diaphanosoma brachyrum, Alona rectangula, Diatomus gracilis, Eucyclops serrulatus and Keratella quadrata) were studied from March-Sept. in different estuaries of the Kuban River (USSR) to determine the effects of the discharge from intensively irrigated rice fields in the region. Such pesticides as DDT, DDD, DDE, DDVP 2,2 dichlorovinyl dimethyl phosphate, hexachlorocyclohexane, lindane, propanide and Dipterex were used in the fields in large amounts and polluted soil and waters of the estuaries. A comparison of the seasonal dynamics of 3 estuaries showed that in the Sladkii estuary, which served as the control, there was a summer maximum increase in the zooplankton biomass; the role of C. auaedulcis and the total amount of zooplankton decreased in the Karpievskii estuary in the summer where an inflow of discharge water took place; in the Kurchanskii estuary where there were both an inflow from the rice field with pesticides and an outlet to the sea, the composition of the zooplankton was maintained with the saltwater Calanipeda predominating but the overall zooplankton biomass decreased 4-6 times. The Kuban delta region is one of the main natural procedures of valuable commercial fish such as the zander and the Azov roach; the continued disposal of discharge water into the estuaries will lead to a redistribution of dominant species and a decrease in the food base of these fish in this region.--Copyright 1976, Biological Abstracts, Inc.
W77-07331

A STUDY ON STANDING CROPS IN PHRAGMITES COMMUNIS COMMUNITIES AND THEIR ENVIRONMENTAL FACTORS, (IN KOREAN),
Mokpo Teachers' Coll. (South Korea).
C. S. Kim.
Korean J Bot 18(3), p 129-134, 1975.

Descriptors: *Standing crops, *Humus, *Chlorine, Hydrogen ion concentration, Sea water, Tidal water, Estuaries, Environmental effects.
Identifiers: Korea, *Phragmites-Communis, *Reed communities, *Youngsan River estuary(Korea).

The relationship between biomass of reed communities (P. communis) and several environmental factors as Cl, pH, humus content in soil and depth of seawater was studied. One site had 2 plots: H plot, in the shallows, was not submerged except at full tide or from heavy rainfall; M plot, at medium depth, submerged at every common tide. The other site also had 2 plots: M' plot, at medium depth, submerged about 10 h at each tide, and L plot, in deep seawater submerged at every tide at a bank along the east estuary of the Youngsan River (Korea). The maximum standing crop of the reed community occurred on June 25th: biomass at H, M, M' and L plot were, respectively, 4.65, 3.60, 0.98 and 0.67 kg dry weight/m3. Densities at H, M, M' and L plot were 67, 78, 244 and 333 plants/m2. Net production of the terrestrial parts of the reed community on the outside of the bank were as much as a sixth less than that on the inside, but the density on the outside of the bank was 4 or 5 times higher than that on the inside. The growth of reed plants was inhibited by high Cl, high pH, less humus in soil and submergence in seawater for long periods.--Copyright 1976, Biological Abstracts, Inc.
W77-07335

THE RESPONSES OF SOME ESTUARINE ORGANISMS TO SUSPENDED SOLIDS,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
For primary bibliographic entry see Field 8D.
W77-07353

EFFECT OF THE ASWAN HIGH DAM ON THE NILE FLOOD AND ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-07363

DYNAMICS OF O2 AND CO2 EXCHANGE, PHOTOSYNTHESIS, AND RESPIRATION IN RIVERS FROM TIME-DELAYED CORRELATIONS WITH IDEAL SUNLIGHT,
Washington Univ., Seattle. Dept. of Chemistry.
J. M. Schurr, and J. Ruchti.
Limnology and Oceanography, Vol 22, No 2, p 208-225, March 1977. 4 fig, 13 tab, 14 ref.

Descriptors: *Oxygen, *Carbon dioxide, *Rivers, *Model studies, Mathematical models, Dissolved oxygen, Photosynthesis, Photosynthetic oxygen, Gases, Transpiration, Light, Solar radiation, Correlation analysis, Analytical techniques, Hydrogen ion concentration.
Identifiers: *Switzerland.

The oxygen exchange constant, photosynthetic rate, and respiration rate for several Swiss rivers were determined, using only the continuous data record of a single oxygen electrode, the measured temperature, and an assumed ideal light intensity curve in conjunction with a simple model rate equation and a novel cross-correlation computational technique. The method can be extended to determine also total carbonate dynamics from continuous pH measurements. For the Aare at Bern in March 1974, the oxygen exchange constant was 0.38/h, the respiration rate was 0.6 mg/liter/h, and the mean photosynthetic rate was 0.28 mg/liter/h. The exchange rate for dissolved (but not hydrated or ionized) CO2 was 0.91 times that for dissolved oxygen, and the ratio of O2 molecules released to CO2 molecules consumed during photosynthesis was about 1.2. (Sims-ISWS)
W77-07364

FURTHER TRANSITION STATES OF THE BAJA CALIFORNIA UPWELLING ECOSYSTEM,
Brookhaven National Lab., Upton, N.Y. Oceanographic Sciences Div.
J. J. Walsh, T. E. Whitledge, J. C. Kelley, S. A. Huntsman, and R. D. Pillsbury.
Limnology and Oceanography, Vol 22, No 2, p 264-280, March 1977. 11 fig, 3 tab, 37 ref. NSF GB-358804, GX-33502.

Descriptors: *Red tide, *Upwelling, *Phytoplankton, *Crabs, Winds, Circulation, Water circulation, Hydrography, Nutrients, Salinity, Temperature, Water temperature, *Zooplankton, Dinoflagellates, Diatoms, Biomass, Marine biology, Marine plants, Marine microorganisms, Aquatic life, Oceans, Coasts, Oceanography, Pollutant identification.
Identifiers: *Baja California.

Measurements were made of wind, surface circulation, hydrography, nutrients, and phytoplankton and zooplankton rate processes in a time series at 27 N during April 1973. A string of current meters and a towed acoustic body were also used to assess the distribution of subsurface currents and red crabs. The seasonal onset of upwelling had already occurred. Diatoms were initially the dominant primary producers. Two perturbations of the upwelling state were observed in response to relaxation of the winds. A comparison of this study with a preceding one in March 1972 indicated that the rate of upwelling, the nutrient content, and the phytoplankton specific growth rate were about the same in both years. The total productivity and biomass of the phytoplankton were less in 1973, implying that greater grazing stress was associated with a switch from smaller dinoflagellates to larger diatoms. Local temporal variability of upwelling off Baja California is postulated to have led to the replacement of clupeids by the red crab as a facultative herbivore. (Sims-ISWS)
W77-07365

INTERACTION OF TEMPERATURE AND SALINITY ON OXYGEN CONSUMPTION OF THE ESTUARINE CRAB PANOPEUS HERBSTII,
Wake Forest Univ., Winston-Salem, N. C. Dept. of Biology.
R. V. Dimock, Jr., and K. H. Groves.
Marine Biology, Vol 33, 1975, p 301-308, 2 fig, 4 tab, 35 ref.

Descriptors: Environmental effects, Metabolism, *Temperature, *Salinity, *Crabs, *Oxygen, Estuarine environment, Water pollution effects.
Identifiers: Panopeus herbstii, Synergistic effects.

Crabs were acclimated to combinations of 10 and 23 C and 5 and 30% S. Rate of oxygen consumption was measured at 10 and 25 C in salinities of 5, 15, 30, and 40% salinity. Male crabs acclimated to 23 C and 5% S and tested at 25 C had higher rates than females at experimental salinities of 40 and 30% S. No significant differences in oxygen consumption between males and females occurred at other temperature and salinity combinations. An increase in oxygen donsumption upon exposure to low salinity was observed. Adjustments to low temperature following acclimation was also observed but some unpredictable patterns of response were seen. No single hypothesis could be suggested to accout for the temperature and salinity effects on metabolic rate. (Chilton-ORNL)
W77-07375

A CONTRIBUTION TO THE LIFE HISTORY OF THE CUNNER, TAUTOGOLABRUS ADSPERSUS, IN FISHERS ISLAND SOUND, CONNECTICUT,
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
C. B. Dew.

Chesapeake Science, Vol 17, No 2, June 1976, p 101-113, 8 tab, 3 fig, 34 ref.

Descriptors: Environmental effects, *Life history studies, *Seasonal, Growth rates, Spawning, Sexual maturity, Temperature, Behavior, *Connecticut.
Identifiers: *Cunners, Tautogolabrus adspersus, Fishers Island Sound(Conn).

Length-weight relationships and seasonal changes in condition, age and growth, spawning period, age at maturity and sex ratio, and nocturnal and winter habits of the cunner were studied. No significant differences were observed between length-weight relationships for male and female cunners with gonads and stomach contents removed. A general trend of improving condition from spring through fall was seen. Males grew faster than females with maximum readable age for both sexes being five years. Both male and female cunners matured and spawned when one year old. An overall male to female sex ratio of 2.2:1 was found. Cunners remained active until water temperatures dropped to about 8 C and remained dormant until temperatures rose to 6 or 7 C in the spring. Noctiurnal behavior was characterized by assumption of a tactile resting attitude without a camouflage color pattern and a distinct banding resulting in a camouflage effect when in a relatively unprotected position. (Chilton-ORNL)
W77-07377

SUMMER GROWTH DEPRESSION IN THE STRIPED MULLET, MUGIL CEPHALUS L.,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
J. J. Cech, Jr., and D. E. Wohlschlag.
Contributions in Marine Science, Vol 19, 1975, p 91-99, 3 tab, 1 fig, 29 ref.

Descriptors: Environmental effects, *Growth rates, Seasonal, Metabolism, Respiration, Food abundance, *Mullets, *Texas, Coasts.

Growth rates of striped mullet along the south Texas coast were studied as part of an investigation of physiological responses to seasonal temperatures throughout the year. Two periods of slow growth were found to occur, one during the colder late autumn and winter months and another during the summer. Food availability should be maximal during the summer months. The summer growth rate depression coincides with observations of pronounced summer depression of active and routine respiratory rate. This implies unknown summertime changes in food assimilation and in biochemical metabolic pathways. (Chilton-ORNL)
W77-07378

RESPONSE OF THE MARINE ANGIOSPERM PHYLLOSPADIX TORREYI TO CERTAIN ENVIRONMENTAL VARIABLES: A PRELIMINARY STUDY,
California Univ., Davis. Dept. of Botany.
F. R. Drysdale, and M. G. Barbour.
Aquatic Botany, Vol. 1, 1975, p 97-106, 1 fig, 4 tab, 19 ref.

Descriptors: Environmental effects, *Growth rates, *Marine plants, Salinity, Light, Temperature, *Growth rates.
Identifiers: Angiosperms, *Phyllospadix torreyi.

Leaf growth rate of Phyllospadix torreyi was studied under both laboratory and field conditions. It is hypothesized that spring growth rate is greater than measured winter growth rate and that the change is triggered by increasing daily incident light energy. In laboratory cultures, optimum growth occurred in sea water concentrations of 29,000 ppm, 100 lm/sq. ft light intensity for 12-h day, at water temperatures of 12-14 C. Although growth declined at lower salinities, lower light intensities, and higher temperatures, the magnitude of decline indicated a broad tolerance range for these three parameters. (Chilton-ORNL)
W77-07379

THE INFLUENCE OF TEMPERATURE ON SCOPE FOR ACTIVITY IN CUTTHROAT TROUT, SALMO CLARKI,
Utah Cooperative Fishery Unit, Logan.
W. P. Dwyer, and R. H. Kramer.
Transactions of the American Fisheries Society, Vol. 104, No. 3, July 1975, p 552-554, 1 fig, 1 tab, 9 ref.

Descriptors: *Environmental effects, *Metabolism, Oxygen, *Temperature, *Cutthroat trout.
Identifiers: Scope for activity(Fish).

Cutthroat trout 13-16 months old and weighing an average of 90 grams were acclimated at 17 C. Metabolic rate estimates were then made at temperatures of 5, 10, 15, 20, and 25 C. Active metabolism was found to be lowest at 5 C and highest at 15 C. Scope for activity ranged from 316 mg 02/kg-h at 5 C to 486 mg 02/kg-h at 24 C. Standard metabolisms were 47, 73, 111, 129 and 117 mg 02/kg-h at 5, 10, 15, 20, and 24 C, respectively. It was concluded that, all factors being equal, the greater the scope for activity, the greater resistance to fatigue and the higher the probability of survival when the limiting factor is physiologically available oxygen. (Chilton-ORNL)
W77-07380

ATTAINMENT OF THE FINAL THERMAL PREFERENDUM IN BROWN BULLHEADS ACCLIMATED TO DIFFERENT TEMPERATURES,
Yale Univ., New Haven, Conn. John B. Pierce Foundation Lab.
L. I. Crawshaw.
Compilations in Biochemistry and Physiology, Vol. 52A, 1975, p 171-173, 2 fig, 1 tab, 9 ref.

Descriptors: Environmental effects, *Temperature, *Behavior, Fish, Thermocline, *Bullheads.
Identifiers: Acclimation, Temperature selection, Brown bullheads, Thermal preferendum.

Brown bullheads were acclimated at 7, 15, 24, and 32 C. After 10-20 days in the temperature acclimation tanks, the fish were placed in a thermal gradient and allowed free selection of the ambient water temperature. Selected temperature was recorded for one to two days. After 10 hours in the gradient, the mean selected temperature of the fish acclimated to 7 and 15 C was 25 C and the temperatures selected by fish acclimated to 24 and 32 C was between 29 and 31 C. Regardless of the acclimation temperature, brown bullheads eventually selected temperatures of 29-31 C, the probable final thermal preferendum for the species. (Chilton-ORNL)
W77-07381

BACTERIOLOGY OF CHESAPEAKE BAY SURFACE WATERS,
Maryland Univ., College Park. Dept. of Microbiology.
T. M. Cook, and C. K. Goldman.
Chesapeake Science, Vol. 17, No. 1, March 1976, p 40-49, 3 fig, 4 tab, 16 ref. NSF-RANN G. I-29906.

Descriptors: *Bacteriology, *Chesapeake Bay, Seasonal, Temperature, Bacteria, Surface waters, Populations, Water pollution effects, Monitoring, Water temperature.

Selected bacterial counts were monitored at two sites in Chesapeake Bay. During spring warm-up, rising total viable counts peaked at a water temperature of 19 C on May 30. Hydrogen sulfide producers also reached peak levels at 19 C and remained constant during early spring. The fermenter population reached maximum densities on May 5, V. parahaemolyticus remained undetectable until the water temperature reached 21 C. During autumn cooling, the total viable count of the heterotrophic bacterial population fell only slightly but the population changed in composition. A marked decrease was seen in proportion of sme fermentative organisms, hydrogen sulfide producers, and Vibrio parahaemolyticus while no change was seen in coliform densities. (Chilton-ORNL)
W77-07382

THE INFLUENCE OF TEMPERATURE AND TIME OF YEAR ON THE OXYGEN UPTAKE OF THE SEA MUSSEL MYTILUS EDULIS,
Rijksinstituut voor Visserijonderzoek, Texel (Netherlands). Dept. of Shellfish Culture.
C. G. N. de Vooys.
Marine Biology, Vol. 36, 1976, p 25-30, 3 fig, 23 ref.

Descriptors: Environmental effects, *Respiration, *Temperature, Seasonal, *Mussels, Metabolism, *Oxygen.

Cultivated sea mussels collected from cultivation beds in the western part of the Dutch Wadden Sea were studied under conditions as natural as possible. Phytoplankton density and composition used for feeding were similar to that found in coastal waters. A linear increase in oxygen uptake per unit animal weight from about 3 C to a maximum of 20-22 C was found. At higher temperatures oxygen uptake decreased. When spawning and recovery occurred, oxygen uptake was higher than in the autumn at the same water temperatures. A clearly higher oxygen uptake which was noted in summer compared with that in winter was explained by the avoidance of temperature adaptation and acceleration of gametogenesis in this study. (Chilton-ORNL)
W77-07383

THE EFFECT OF SALINITY AND CYCLIC TEMPERATURE ON LARVAL DEVELOPMENT OF THE MUD-CRAB RHITHROPANOPEUS HARRISII (BRACHYURA: XANTHIDAE) REARED IN THE LABORATORY,
Zoologisk Museum, Oslo (Norway).
M. E. Christiansen, and J. D. Costlow, Jr.
Marine Biology, Vol. 32, 1975, p 215-221, 5 fig, 6 tab, 10 ref.

Descriptors: Environmental effects, *Larval growth stage, *Temperature, *Salinity, Laboratory tests, *Crabs.
Identifiers: Mud-crab, Rhithropanopeus harrisii.

Larvae were reared from hatching to first or second stage in temperature-salinity combinations of 5, 20, and 35 % S at 20 to 25 C, 25 to 30 C, and 30 to 35 C, and 25 % S at 20 to 25 C and 30 to 35 C. All salinity-cyclic temperature combinations resulted in survival to the megalops and first stage crabs except 5 % S at 30 to 35 C. 94% survival to the megalops and 90% survival to the first crab stage occurred in 20% S at 20 to 25 C. All other combinations showed a reduction in survival to the first crab stage. Temperature significantly affected the duration of larval stages. Shortest development time was found in 20% S at 30 to 35 C and the longest time in 5% and 35 % S at 20 to 25 C. High percentages of abnormalities occurred in larvae reared in 35% S at all cycles of temperature with the highest percentage occurring at 30 to 35 C. It was concluded that larval development of S. harrisii is strongly influenced by environmental factors and not solely related to genetic differences. (Chilton-ORNL)
W77-07384

INFLUENCE OF LIGHT AND TEMPERATURE ON THE PHOTOSYNTHETIC RATE OF MARINE BENTHIC DIATOMS,
Groningen Rijksuniversiteit (Netherlands). Dept. of Systematic Botany.
F. Colijn, and G. van Buurt.

Marine Biology, Vol. 31, 1975, p 209-214, 4 fig, 20 ref.

Descriptors: Environmental effects, *Photosynthesis, *Light, *Temperature, *Diatoms, Aquatic algae, Benthic flora.
Identifiers: Amphiprora alata.

Investigations which are reported include: (1) light saturation of the photosynthetic rate of suspensions at 6 and 12 C; (2) light saturation of the photosynthetic rate of suspensions of cultured Amphiprora alata cells at 12 C; (3) light saturation of the photosynthetic rate of intact bottom samples at 12 C; (4) relation between temperature and photosynthetic rate of mixed sediment samples. Photosynthetic rate of mixed field populations is saturated by light intensity of 10,000 lux. No photoinhibition was found at higher intensities. Cultures of A. alata exhibited strong photoinhibition at intensities of 10,000 to 60,000 lux. Photosynthetic rate was found to increase approximately 10%/degree C in a range of 4 to 20 C. Epipelic and epipsammic species showed no differences in photosynthetic pattern. (Chilton-ORNL)
W77-07385

LIFE HISTORY PATTERNS IN THE COASTAL SHINER, NOTROPIS PETERSONI, FOWLER,
University of South Florida, Tampa. Dept. of Biology.
B. C. Cowell, and C. H. Resico, Jr.

Descriptors: Environmental effects, *Temperature, *Life history studies, Period of growth, *Shiners, *Florida, *North Carolina, Growth rates.

The coastal shiner in central Florida has a protracted breeding season, rapid growth rate, and probably a one-year life cycle. At the northernmost limit of the species in North Carolina, the breeding season is shorter, growth rates are slower, and the duration of the life cycle is approximately three years. In Florida, spawning occurred in March-September, fecundity ranged from 110-694 mature ova/ female. Young-of-the-year from early spring spawning averaged 33.8 mm in length by late June and reached adult size by October. Later spawned young-of-the-year grew at similar rates and all young-of-the-year reached 59.0 mm by December. (Chilton-ORNL)
W77-07386

STUDY ON THE HERBICIDAL PROPERTIES OF BENTHIOCARB; FACTORS AFFECTING HERBICIDAL ACTIVITY AND ITS BEHAVIOR IN SOIL, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07387

BREEDING BIOLOGY OF A NON-DIADROMOUS GALAXIID, GALAXIAS VULGARIS STOKELL, IN A NEW ZEALAND RIVER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Zoology.
P. L. Cadwallader.
Journal of Fish Biology, Vol 8, 1976, p 157-177, 10 tab, 5 fig, 42 ref.

Descriptors: *Reproduction, Environmental effects, Temperature, *Spawning, Fish, Life history studies, Sexual maturity, Eggs, Growth rates, Fecundity.
Identifiers: *New Zealand, Galaxias vulgaris, *Galaxid.

Onset of spawning in Galaxias vulgaris appeared to be temperature-dependent. No females were found to mature in the first year but 95 to 68% of age 0 plus males were mature in consecutive years. Age 0 plus males probably play an important role in adverse conditions by significantly increasing the proportion of ripe males and ensuring fertilization of all eggs. No evidence of pair formation for the purpose of spawning was found, but spawning seemed to be communal to some extent. In mature fish, ovaries represented 23% and testes 11% of somatic weight. Size appeared to determine maturity in males and age appeared to be the determining factor in females. Egg numbers ranged from 284 to 1911 per fish with weight being the best indicator of fecundity. (Chilton-ORNL)
W77-07389

QUALITATIVE AND QUANTITATIVE STUDIES ON THE MEIOFAUNA OF A TROPICAL FRESH WATER STREAM SUBJECT TO TIDAL INFLUENCE, (IN ITALIAN),
Andhra Univ., Waltair (India). Dept. of Zoology.
A. L. N. Sarma, C. G. Swamy, K. V. R. Murthy, and K. V. Rao.
Riv Idrobiol 13(2), p 249-260, 1974.

Descriptors: Ecology, Streams, Tropic, *Bioindicators, *Organic matter, Water pollution, Tides, Brackish water, Estuaries, Aquatic life, *Diptera, *Nematodes, *Oligochaetes.

An ecological study of the meiofauna in a tropical freshwater stream showed that the organic material at certain locations contributes to the enrichment of the environment and animal life. Oligochetes, menatodes and chironomids are abundant in polluted waters and the presence of these forms of life is an indicator of the quality of the environment. The maximum density of living organisms was found at 0-5 cm depth. The numerical density of the fauna compares favorably with that ob frackish waters and of estuary systems. Coarse and sharp sand is inadequate for a prolific development of a faunistic societies. Fine or medium sand, covered with a coating of organic matter, on the other hand, supports a rich growth of life.--Copyright 1977, Biological Abstracts, Inc.
W77-07390

STUDIES ON THE EFFECT OF TEMPERATURE ON THE EGG LAYING OF THREE SPECIES OF CALANOID COPEPODS IN THE LABORATORY (ACARTIA TONSA, TEMORA LONGICORNIS, AND PSEUDOCALANUS ELONGATUS),
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
C. J. Corkett, and F. J. Zillioux.
Bulletin of Plankton Society of Japan, Vol 21, No 2, 1975, p 13-21, 1 fig, 2 tab, 22 ref.

Descriptors: Environmental effects, *Reproduction, *Temperature, *Copepods, Laboratory tests, Eggs, Hatching.
Identifiers: Acartia tonsa, Temora longicornis, Pseudocalanus elongatus.

Of the species studied, Acartia tonsa and Temora longicornis lay single eggs while Pseudocalanus elongatus is a sac-carrying copepod. Temperature was not found to significantly affect the number of eggs in a sac but the sac size (and therefore the number of eggs) appeared to be determined by the size of the female. The average number of eggs produced per female per day by T. longicornis and P. elogatus increased with increasing temperature. It was concluded that sac-carrying copepods are limited in their egg production rate because a new sac cannot be laid until the old one hatches. (Chilton-ORNL)
W77-07391

LIFE HISTORY NOTES FOR A POPULATION OF SLIMY SCULPIN (COTTUS COGNATUS) IN AN ALASKAN ARCTIC STREAM,
Aquatic Environments Ltd., Calgary (Alberta).
P. C. Craig, and J. Wells.
Journal of the Fisheries Research Board of Canada, Vol 33, 1976, p 1639-1642, 2 fig, 2 tab, 12 ref.

Descriptors: *Life history studies, Environmental effects, Temperature, Seasonal, Growth rates, Sexual maturity, Eggs, Spawning, *Sculpins, *Alaska, *Arctic.

Growth, maturity, fecundity, and food habits are described of slimy sculpin in the headwaters of the Chandalar River and the data are compared to accounts of the populations in southern latitudes. Growth was slower in the Chandalar population with the maximum age of 7 year fish seldom exceeding 100 mm in length. Sexual maturity for both sexes was reached at age 3-4 as opposed to age 1-2 for Montreal River populations. The Chandalar fecundity count for females ranging in length from 68-99 mm was 206 eggs with a standard deviation of 66.2. No significant difference was noted in sex ratio. Spawning season was in late May shortly after spring breakup. Chandalar sculpins fed almost exclusively on larvae of stream-dwelling insects. (Chilton-ORNL)
W77-07393

AQUATIC ORGANISM CONTAMINATION BY MERCURY RESIDUES IN THE COATZACOALCOS RIVER ESTUARY, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto Nacional de Energia Nuclear.
A. P. Baez, R. de Nulman, I. Rosas, and L. C. Galvez.
In: Trace Contaminants of Agriculture, Fisheries and Food in Developing Countries, Internation Atomic Energy Agency, 1976 p 73-79, 5 tab, 8 ref.

Descriptors: *Environmental effects, *Water pollution effects, Industrial wastes, *Mercury, Aquatic animals, Vegetation, Estuaries, *Mexico, Marine animals.
Identifiers: *Coatzoalcos River estuary(Mex).

Mercury residues in the biotic and abiotic elements of the estuary were measured over a two-year period. Highest levels were found in sediments and benthonic organisms. From observations of the Hg levels in the stomach contents, it was concluded that the feeding habits are responsible for the ingestion and accumulation of this metal in the tissues. In vegetation, the highest Hg levels were found in plants growing on the banks of a creek which is the primary receptor of liquid wastes from a chlor-alkali factory. (Chilton-ORNL)
W77-07394

ACCUMULATION AND DISTRIBUTION OF TRACE METALS AND RADIONUCLIDES IN MARINE ORGANISMS (PARTICULARLY TAPES DECUSSATUS L.) IN THE IZMIR BAY AREA, TURKEY,
Aegean Univ., Bornova (Turkey). Marine Biological Lab.; and Aegean Univ., Bornova (Turkey). Dept. of General Zoology.
R. Geldiay, and H. Uysal.
In: Trace Contaminants of Agriculture, Fisheries and Food in Developing Countries, Internation International Atomic Energy Agency, 1976 p 81-85, 2 tab, 1 fig, 9 ref.

Descriptors: *Environmental effects, Absorption, Distribution, *Trace elements, *Radioisotopes, Marine animals, *Metals, Bays, Cadmium, Water pollution effects.
Identifiers: *Tapes decussatus, *Turkey, *Izmir Bay(Turkey).

Concentrations of trace metals in Tapes decussatus were determined in relation to polluted and nonpolluted waters. Cadmium concentrations were higher than the other elements. Concentrations of trace elements were higher in digestive glands, mantle and siphon, gills and palps. Uptake occurred through direct contact with the environment and through the digestive gland. The speed of radioactive uptake increased very slowly after a definite level and the loss occurred slowly after a definite level. (Chilton-ORNL)
W77-07395

DEVELOPMENT OF EGGS AND EMBRYOS OF THE SURF CLAM, SPISULA SOLIDISSIMA, IN SYNTHETIC SEAWATER,
National Marine Fisheries Service, Milford, Conn. Middle Atlantic Coastal Fisheries Center; and National Marine Fisheries Service, Milford, Conn. Milford Lab.
W. D. Cable, and W. S. Landers.
Fishery Bulletin, Vol. 72, No. 1, p 247-249, 8 ref.

Descriptors: Environmental effects, *Growth stages, Embryonic growth stage, *Clams, Salinity, Temperature, Mortality.
Identifiers: Surf clams, Spisula solidissima.

Observations on the development of eggs and embryos were made in salinities of 25 and 30% at 10, 15, and 20 C. Temperatures of 20 C were the optimum for development. This temperature allowed eggs to be reared to the 5-day-old stage with almost 100% survival and no signs of larval abnormality. (Chilton-ORNL)
W77-07396

COMPARATIVE ECOPHYSIOLOGY OF GAMMARIDS (CRUSTACEA: AMPHIPODA) FROM MARINE, BRACKISH AND FRESH-WATER HABITATS, EXPOSED TO THE INFLUENCE OF SALINITY-TEMPERATURE COMBINATIONS. I. EFFECT ON SURVIVAL,
Amsterdam Univ., Netherlands, Dept. of Experimental Biology.
J. Dorgelo.
Hydrobiological Bulletin Netherlands, Vol. 8, No. 1 and 2, 1974, p 90-108, 4 tab, 4 fig, 110 ref.

Descriptors: *Environmental effects, *Temperature, *Salinity, *Crustaceans, Freshwater, Brackish water, Sea water, Mortality.
Identifiers: *Gammarids, Synergistic effects.

Survival of mature males of three gammarids from different salinity regimes, ranging from marine to limnetic conditions, was established to analyze the primary as well as the interaction effect of salinity and temperature. Salt tolerance is neither favored nor inhibited by temperature interaction in the natural salinity ranges of the species. Increasing temperature influenced survival negatively in all species. C. tigrinus was most susceptible in spring to both salinity and temperature. (Chilton-ORNL)
W77-07397

PRIMARY PRODUCTION AND BIOMASS OF ALGAE POPULATIONS IN AN OLIGOTROPHIC LAKE IN THE FRENCH MASSIF CENTRAL, (IN FRENCH),
J. Devaux, and N. Lair.
Hydrobiologia 50(3), p 209-220, 1976.

Descriptors: *Primary productivity, *Biomass, *Algae, *Oligotrophy, Lakes, Biota, Chlorophyll, Carbon, Standing crops.
Identifiers: *France(Massif-Central).

Phytoplanktonic populations were studied in Tazenat lake by 3 methods: primary production using 14C, standing crop estimation and measuring the amount of chlorophyll a. A comparison of the results obtained gives an insight into the utilization and transformation of energy by the biota of the lake.--Copyright 1977, Biological Abstracts, Inc.
W77-07398

OXYGEN CONSUMPTION, VENTILATORY FREQUENCY AND HEART RATE OF LAMPREYS (LAMPETRA FLUVIATILIS) DURING THEIR SPAWNING RUN,
Bath Univ. (England). School of Biological Sciences.
P. N. Claridge, and I. C. Potter.
Journal of Experimental Biology, Vol. 63, 1975, p 193-206, 8 fig, 28 ref.

Descriptors: Environmental effects, Respiration, Metabolism, *Oxygen requirements, *Lampreys, *Spawning.

Studies were conducted during the light phase of the photoperiod and at times which corresponded to various stages in upstream migration. Although all three parameters increased during the spawning run, significant differences between sexes were noted only in mature individuals. Regression coefficients for the logarithmic relationship between oxygen consumption and body weight of immature animals were 0.912 at 9.5 C and 0.925 at 16 C. Standard rate of oxygen comsumption and amount of oxygen taken up increased during hours of darkness. Oxygen consumption, ventilatory frequency and, to a lesser extent, heart rate, increased significantly at 9.5 C over the 100-20% range of saturation with air. Below 20% saturation with air, animals did not remain attached by their oral disc for prolonged periods and the ventilatory frequency rose to a maximum of 175 beats/min at 12.5%. Death occurred within 5-8 h after exposure to 7.5%. (Chilton-ORNL)
W77-07399

HEMATOLOGY OF JUVENILE STRIPED BASS, MORONE SAXATILIS (WALBAUM), ACCLIMATED TO DIFFERENT ENVIRONMENTAL CONDITIONS,
California State Dept. of Fish and Game, Rancho Cordova. Water Pollution Control Lab.
L. A. Courtois.
Compilations in Biochemistry and Physiology, Vol. 53A, 1976, p 1-3, 1 tab, 16 ref.

Descriptors: Environmental effects, *Temperature, *Salinity, *Stripped bass.
Identifiers: *Hematology, *Dechlorinated water.

Stripped bass were subdivided into four different groups with each being acclimated to temperature-salinity combinations as follows: (A) Warm Fresh water-dechlorinated city water, temperature 17.5 C plus or minus 0.5 C; (B) Cold fresh water-dechlorinated city water, temperature 10.8 C plus or minus 0.3 C; (C) Warm sea water-bay sea water (30ppt), temperature 17.5 C plus or minus 0.5C; (D) Cold sea water-bay sea water (30 ppt), temperature 10.5 C plus or minus 0.5 C. Results indicated salt water acclimated fish had lower blood parameters serum K and higher serum Na levels than fresh water acclimated fish at similar temperatures. Increased temperature appeared to cause reverse effects in fresh- and salt water-acclimated fish. (Chilton-ORNL)
W77-07400

RESPIRATORY RESPONSES OF GILLICHTHYS MIRABILIS TO CHANGES IN TEMPERATURE, DISSOLVED OXYGEN AND SALINITY,
California State Dept. of Fish and Game, Rancho Cordova. Water Pollution Control Lab.
L. A. Courtois.
Compilations in Biochemistry and Physiology, Vol. 53A, 1976, p 7-10, 5 fig, 21 ref.

Descriptors: Environmental effects, *Respiration, Oxygen, *Temperature, *Salinity, Fish, *Dissolved oxygen.
Identifiers: *Gillichthys mirabilis.

G. mirabilis acclimated to temperature of 28.6C displayed an increased rate of respiration compared to fish acclimated to a temperature of 11.0 C. Fish acclimated to intermediate temperatures displayed intermediate respiration rates. Decreasingly available ambient oxygen resulted in a diminished respiration. Changes in salinity did not appear to modify respiratory rates for the species. (Chilton-ORNL)
W77-07401

A BIBLIOGRAPHY OF SOVIET LITERATURE ON FRESHWATER HYDROBIOLOGY AND RELATED PROBLEMS FOR 1975: PART 21, (IN RUSSIAN),
Y. Y. Tseeb.
Gidrobiol Zh 12(3), p 111-123, 1976.

Descriptors: *Bibliographies, *Hydrobiology, Water chemistry, Toxicity, Invertebrates, Microbiology, Parasitology, Surface water, Public health, Water pollution.

Over 300 recent Soviet publications are listed under the following headings: freshwater hydrobiology, sanitation hydrobiology, water toxicology, invertebrate physiology, aquatic microbiology, surface water hydrochemistry and freshwater invertebrate parasitology. Articles from the GIDROBIOLOGICHESKII ZHURNAL (HYDROBIOLOGICAL JOURNAL) are not included.--Copyright 1977, Biological Abstracts, Inc.
W77-07402

SEASONAL CHANGES IN HEMATOLOGY OF RAINBOW TROUT, SALMO GAIRDNERI,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
J. E. Denton, and M. K. Yousef.
Compilations in Biochemistry and Physiology, Vol. 51A, 1975, p 151-153, 1 tab, 15 ref.

Descriptors: Environmental effects, *Seasonal, *Temperature, *Rainbow trout, Water temperature.
Identifiers: *Hematology, Hematocrit, *Hemoglobin, Serum protein, Mean cell volume, Mean cell hemoglobin, Mean cell hemoglobin concentration, Blood cells.

Five to seven trout varying in age from 11 to 14 months were captured each month from March 1972 to January 1973. In spite of the fact that water temperatures remained constant at 11-13 C, seasonal changes were observed in hemoglobin, hematocrit, serum protein, mean cell volume, mean cell hemoglobin, and mean cell hemoglobin concentration. Diet, metabolic adaptations and activity were suggested as probable causes of these changes and it was concluded that water temperature did not appear to be responsible for variations in hematology in rainbow trout. (Chilton-ORNL)
W77-07403

CULTURE STUDIES ON EUCHEUMA NUDUM J. AGARDH, A CARRAGEENAN PRODUCING RED ALGA FROM FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
C. J. Dawes, J. W. LaClaire, and R. E. Moon.
Aquaculture, Vol. 7, 1976, p 1-9, 4 tab, 1 fig, 17 ref. NOAA Office of Sea Grant No. 04-3-158-45.

Descriptors: Environmental effects, *Laboratory tests, Cultures, *Algae, *Light, *Temperature, *Nutrients, Nitrates, *Growth rates, *Florida, *Rodophyta.
Identifiers: Synergistic effects, Carrageenan, Eucheuma nudun J. Agardh.

Optimum growth conditions for Eucheuma nudum J. Agardh were studied in the laboratory. Plant responses to light, temperature and nutrient levels were monitored. The algae was found to develop high photosynthetic rates when exposed to a combination of moderate temperatures (20-24 C) and light levels (300-600 ft-candles) and to nitrate concentrations of 10-100 times those found under natural conditions. It appeared that synergistic effects exist between various levels of light and temperature and that these factors should be considered in combination. Increased nitrate levels significantly influenced photosynthetic response. (Chilton-ORNL)
W77-07404

MORBIDITY AND MORTALITY OF MARINE MAMMALS,
Alaska Univ., College. Inst. of Artic Biology; and Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-07405

TROPHIC RELATIONSHIPS AMONG ICE INHABITING PHOCID SEALS,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-07407

THE DISTRIBUTION, ABUNDANCE, DIVERSITY AND PRODUCTIVITY OF THE WESTERN BEAUFORT SEA BENTHOS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 6G.
W77-07410

A DESCRIPTION AND NUMERICAL ANALYSIS OF THE FACTORS AFFECTING THE PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6G.
W77-07411

ZOOPLANKTON AND MICRONEKTON STUDIES IN THE BERING - CHUKCHI/BEAUFORT SEAS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-07412

PHYTOPLANKTON STUDIES IN THE BERING SEA,
Alaska UUniv., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-07413

BEAUFORT SEA PLANKTON STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-07414

CARBON DIOXIDE AND OXYGEN-NITROGEN RATIOS AS FACTORS AFFECTING SALMON SURVIVAL IN AIR-SUPER-SATURATED WATER,
Corvallis Environmental Research Lab., Oreg. Western Fish Toxicology Station.
A. V. Nebeker, G. R. Bouck, and D. G. Stevens.
Transactions of the American Fisheries Society, Vol. 105 (1976), p. 425-429, 2 tab., 1 fig., 14 ref.

Descriptors: *Sockeye salmon, Juvenile fish, *Mortality, Bioassay, Laboratory test, *Supersaturation, *Atmospheric gases, *Oxygen, *Nitrogen, Carbon dioxide, *Fish disease, Fish physiology, Methodology.
Identifiers: Juvenile sockeye salmon, *Oxygen-nitrogen ratios, *Gas bubble disease, Percent saturation.

Juvenile sockeye salmon (Oncorhynchus nerka) were exposed to lethal levels of air-supersaturated water (120 percent, 125 percent, 130 percent total gas saturation) containing different oxygen-nitrogen ratios and different carbon dioxide concentrations. Fish mortality was not signigicantly different at different carbon dioxide levels (1.7 to 22.0 mg/liter C02) when tested at the same total gas saturation concentrations. Total gas saturation levels are much more important than the 02/N2 ratios, as fish mortality will not occur unless total gas saturation exceeds 100 percent, regardless of the 02/N2 ratios. There was a significant decrease in mortality when the ratio of oxygen to nitrogen was increased while holding the total percent saturation constant. Much more extensive and severe signs of gas bubble disease developed at high 02/N2 ratios than at low 02/N2 ratios, indicating that oxygen plays a significant part in forming external emphysema and lesions. (Katz)
W77-07415

EXPERIMENTS ON THE RESISTANCE OF FISH TO RAPID INCREASE IN HYDROSTATIC PRESSURE,
Freiburg Univ. (West Germany). Limnologisches Institut.
W. Lampert.
Journal of Fish Biology, Vol. 8, (1976), p. 381-383, 2 tab., 2 ref.

Descriptors: *Hydroelectric power, Hydrostatic pressure, Freshwater fish, *Reservoirs, Methodology, Juvenile fish, Perches, Laboratory tests, Carp, Rainbow trout, *Bioassays, *Fish physiology.
Identifiers: West Germany, *Hydrostatic pressure increase, *Swim bladders, Grayling, Roach.

In a few hydro-electric pumping stations in the southern Black Forest it has been found that fish occurring in the high lying reservoirs could only arrive there from the river below after an upward transport through the pumping system. As there is a height difference of 400 m to overcome, the fish must withstand a sudden pressure change of 40 atm. To test whether this is actually possible various species of fish were subjected suddenly to a pressure of 50 atm which was then reduced to 1 atm over a period of 10 min. No mortality occurred. Although the pressure shock symptoms exhibited by the different species of fish were variable, all appeared to be perfectly normal 2 h after the experiment. (Katz)
W77-07416

SWIM BLADDER GAS PRESSURE OF COD IN RELATION TO HYDROSTATIC PRESSURE,
Institute of Marine Research, Bergen (Norway).
G. Sandnes, and T. Gytre.
Journal du Conseil, Vol. 134(3), October, 1972, p. 527-532, 2 fig., 8 ref.

Descriptors: *Cod, *Marine fish, *Hydrostatic pressure, *Fish physiology, *Fish behavior, Laboratory tests, Methodology, *Gases, Saturation, Laboratory animals.
Identifiers: Gadus morhua(L.), *Swimbladder, *Swimbladder gas pressure, *Negative pressure.

Buoyant fish near the surface did not show any swim bladder pressure different from the surroundings. At depths of 40 cm buoyant fish from the upper 20 cm of the open aquaria showed negative gas pressure from the surroundin. Under experimental conditions fish were able to maintain a negative pressure in the swimbladder gas in relation to the surrounding hydrostatic pressure. (Katz)
W77-07417

MINERALIZING MICROBIAL ACTIVITY IN LAKE FARO,
Messina Univ. (Italy). Instituto di Idrobiologia.
S. Genovese, and V. Bruni.
Boll Pesca Piscic Idrobiol 30(1), p 39-56, 1975.

Descriptors: Lakes, +Microbiology, *Mineralogy, Nutrients, Lake sediments, Brackish water, *Hydrogen sulfide, *Sulfides, Salts, Cycling nutrients.
Identifiers: *Lake Faro(Italy).

Continuing studies have been carried out in Lake Faro (Italy) on microbial mineralizing activity and on nutrient salt content. The results of new physico-chemical and microbiological observations on water and sediment samples are reported. The intense microbial activity in the brackish-wate environment causes a strong trophism. There is also a significant contribution of allochthonous material. The presence of H2S in Lake Faro determines a complex of specific, biochemical activities in the S cycle.--Copyright 1977, Biological Abstracts, Inc.
W77-07418

COLLECTION OF JUVENILE SALMONIDS FROM TURBINE INTAKE GATEWELLS OF MAJOR DAMS IN THE COLUMBIA RIVER SYSTEM,
Bureau of Commercial Fisheries, Seattle, Wash.
W. W. Bentley, and H. L. Raymond.
Transactions of the American Fisheries Society, Vol. 97 (1968), p. 124-126, 1 tab., 2 fig., 1 ref.

Descriptors: *Columbia River, *Dams, Dam sites, *Anadromous fish, Chinook salmon, Juvenile fish, *Fish migration, *Fish behavior, On-site investigations, Fish population, *Turbines, *Mortality.
Identifiers: Ice Harbor Dam, *Snake River, *Juvenile salmonids, *Turbine intake gatewells, Migration timing, Seaward migration.

Turbine intake gatewells at Ice Harbor Dam on the Snake River were evaluated for their utility as collection areas of juvenile salmonids. The investigation took place from 1964 through 1966; results indicated that gatewell collecting is economical and efficient. One 3-man crew, in 1964, did the sampling; depending on water flow, the collections represented 2 to 6% of the total population. The sampling rate in the gatewells will enable a high degree of confidence to be placed on measurements of timing, migration rates, survival, and relative mgnitude of the seaward migrations. (Katz)
W77-07419

THE RESPONSE OF FISH BLOOD CELLS, PARTICULARLY THROMBOCYTES, TO DECOMPRESSION,
Washington Univ., Seattle. Fisheries Research Inst.
E. Casillas, L. S. Smith, and B. G. D'Aoust.
Undersea Biomedical Research, Vol. 3(3), September 1976, p. 273-281, 5 tab., 18 ref.

Descriptors: *Chinook salmon, *Fish physiology, *Fish behavior, Laboratory tests, Laboratory animals, *Hydrostatic pressure, Bioassay, Mortality, *Pressure, Depth, Gases.
Identifiers: *Fish blood cells, *Thrombocytes, *Decompression, Hyperbaric chamber, *Lethal decompression, Non-lethal decompression, *Gas solubility, Blood coagulation, Erythrocytes, Leucocytes.

The effects of decompression on various blood-cell types in chinook salmon (Oncorhynchus tshawytscha) were investigated using a 4-liter hyperbaric chamber. Thrombocytes (platelets) were found to decrease significantly in numbers following lethal and nonlethal decompressions. The response was highly dependent on depth, gas solubility, and rate of decompression, whereby increasing depth or gas solubility caused greater and faster declines of thrombocyte levels. Return of thrombocyte numbers to normal values usually occurred within 48 hours, except after the more severe decompressions where recovery was never fully attained during the sampling period. Erythrocyte levels increased significantly 1 day after a severe decompression, suggesting hemoconcentration. Leucocytes appeared not to respond to decompression; they were not decreased compared to normal levels although they were significantly decreased compared to levels of the chamber controls in the nonpressurized chamber. (Katz)
W77-07420

THE EFFECTS OF HIGH VACUUM ON FISH,
Arkansas Game and Fish Commission, Lonoke.
J. Hogan.

Transactions of the American Fisheries Society, Vol. 70, 1941, p. 469-474.

Descriptors: *Freshwater fish, *Mortality, *Fishkill, Arkansas, Bass, Warm water fish, *Laboratory tests, *Floodways, *Siphons, Fish physiology, Methodology, Bioassays.
Identifiers: *St. Francis River(Ark), *Negative pressure, *High vacuum, *Bluegill sunfish.

A set of three large siphon tubes has been installed on the lower St. Francis River in Arkansas, which pass the normal flow of the river. They operate with a negative pressure equivalent to from 18 to 26 inches of mercury. Experiments with fish held under negative pressure in aquaria for the length of time required to pass through the tubes have been conducted and some species of fish show serious injury. Those that are physostomous are more able to make the sudden change or adjustment in the swim bladder necessary when passing through the tubes, while physoclistous fish are unable to make the sudden adjustment and suffer hemorrhage in the circulatory system and many die. There is need for close cooperation between engineers and fishery administrators in designing and constructing devices that are apt to affect fish life in public waters. (Katz)
W77-07421

A NITROGEN GAS (N2) MODEL FOR THE LOWER COLUMBIA RIVER, FINAL REPORT,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-07422

DISSOLVED GAS SURVEY, PACIFIC NORTHWEST REGION.
Bureau of Reclamation, Boise, Idaho. Regional Soil and Water Lab.
December, 1973. 26 p, 36 tab. 3 fig.

Descriptors: *Dissolved oxygen, Nitrogen, *Supersaturation, *Columbia River, *Pacific Northwest, U.S., Oregon, Washington, Idaho, On-site investigations, On-site data collection, Methodology, Dams, Dam sites, Water quality, *Water quality standards, Monitoring.
Identifiers: *Nitrogen supersaturation.

The Bureau of Reclamation conducted nitrogen gas surveys of all the Bureau dams in the Pacific Northwest. A mobile laboratory was used. Only four locations were found where the dissolved nitrogen content was above the usual state standards of 110%. Mason dam waters in Eastern Oregon were 120% saturation near the dam. Most of the excess was dissipated within two miles below the dam. Dissolved oxygen varied between 89 and 112 percent saturation. (Katz)
W77-07423

EFFECTS OF PRESSURE ON SURVIVAL OF SIX SPECIES OF FISH,
Maine Dept. of Inland Fisheries and Game, Augusta.
R. E. Foye, and M. Scott.
Transactions of the American Fisheries Society, Vol. 94 (1965), p. 88-91.

Descriptors: *Hydroelectric power, *Perch, *Lake trout, *Atlantic salmon, Laboratory tests, Bioassay, Mortality, *Hydrostatic pressure, *Maine, *Fish physiology, *Fish behavior, Pumping plants.
Identifiers: Kennebec River(Maine), Wyman River(Maine).

A study was made to determine the effects of pressures likely to be encountered in a pumping station in Maine. Experiments were conducted with chain pickerel, yellow perch, fall fish, common shiner, lake trout and Atlantic salmon. Test fish exhibited extreme and erratic violent swimming activity for the first few seconds after exposure to a pressure of 300 psi. Salmon, lake trout and fall fish experienced no mortality during the 7-day period after exposure. Sixty percent of yellow perch died after 7 days. (Katz)
W77-07424

SUPERSATURATION OF TOTAL DISSOLVED GASES: A REVIEW OF CURRENT LITERATURE,
Idaho Dept. of Environmental and Community Services, Boise.
E. Ralston, E. Quan, R. Pine, and R. Rulifson.
October, 1974, 4 p., 17 ref.

Descriptors: *Supersaturation, *Reviews, *Atmospheric gas, *Fish diseases, Research and development, Standards, Oregon, Washington, Idaho, Bibliographies, *Columbia River, Mortalities, *Salmon, Juvenile fish, Fish behavior.
Identifiers: *Gas bubble disease, *Juvenile steelhead, Juvenile chinook.

A brief review is presented of the more recent and the current research concerned with the biological effects of total dissolved gas supersaturation on Columbia River salmon. The purpose is to provide an informational base for coordinated implementation of the dissolved gas standards of the States of Oregon, Washington and Idaho. (Katz)
W77-07425

EFFECTS OF DAMS ON PACIFIC SALMON AND STEELHEAD TROUT,
National Marine Fisheries Service, Seattle, Wash.
G. B. Collins.
Marine Fisheries Review, Vol. 38(11), November, 1976, p. 39-46, 20 fig.

Descriptors: *Columbia River, *Chinook salmon, *Fish migration, *Fish passage, Fish behavior, Rainbow trout, Fish diseases, *Supersaturation, *Spillways, Water temperature, Research and development, Laboratory tests, On-site investigations, Juvenile fish.
Identifiers: *Snake River, *Gas bubble disease, *Columbia River Basin, *Steelhead trout, *Fishway, *Fish ladders, Fish tracking, Traveling screen, Fish transport, Pacific salmon.

The problems to salmon and steelhead trout utilizing the Columbia and Snake Rivers are described. Methods to solve these problems are suggested. Problems include the upstream passage of adult fish at dams; the downstream passage of juvenile fish; the changing environment caused by dams, gas bubble diseases due to supersaturated atmospheric gases. Engineering structures and fish transport facilities that move the juvenile salmon past the dam hazards are described. Research programs and facilities are discussed. (Katz)
W77-07426

SECOND STATUS REPORT ON ANADROMOUS FISH RUNS OF THE COLUMBIA RIVER,
Oregon Fish Commission, Portland.
C. O. Junge, and J. B. Haas.
Pacific Northwest River Basins Commission, Vancouver, Washington, May 1974, 24 p., 2 fig., 3 tab.

Descriptors: *Columbia River, *Chinook salmon, *Salmon, Rainbow trout, *Dams, *Fish migration, *Fish passage, *Shad, Sport fishing, *Hydroelectric power, Water quality, *Supersaturation, Fish diseases, Mortality, Sockeye salmon.
Identifiers: Spring chinook salmon, Fall chinook salmon, Summer steelhead coho salmon.

The status of the various runs of salmon and shad in the Columbia River is reported. The problems affecting the sports and commercial species on the river include fish passage problems, and the impact of power peaking. Progress is being made to compensate for fish and habitat loss. Supersaturation of atmospheric gases (nitrogen) is responsible for significant mortalities. The removal of water for irrigation and industrial use and the determination of water quality affects the fishery. Recommendations are presented. (Katz)
W77-07427

EFFECT OF SILT AND SALINITY ON THE MORTALITY OF MERETRIX LUSORIA (ROEDING), (IN KOREAN),
Pusan National Univ. (Republic of Korea).
S. D. Chang, P. Chin, and B. O. Sung.
Bull Korean Fish Soc 9(1), p 69-73, 1976.

Descriptors: *Silts, *Salinity, *Mortality, Sands, Oxygen, *Clams, Sediments, Clays, Soils, Water pollution.
Identifiers: Meretrix-lusoria.

Mortality of the clam M. lusoria was measured in experimental cultures under different sediment compositions and different salinities. Mortality was significant in silt and clay and low in sand and sand-silt. In groups cultured in silt and clay, young of 2.5 cm shell length were subject to early and high mortality (85% in 41 days). The larger the shell size the later and lower the mortality. Mortalities of groups maintained in silt and clay differed under different salinities. Survival rate in sea water of low salinity was higher than that in the high salinity water. O2 consumption of isolated gill tissue was little different in groups maintained in silt and clay and those in sand (the control-group). Mortality resulted mainly from the deposition of silt and clay, although the survival rate of M. lusoria depended on water temperature, salinity, dissolved O2, body size and other factors.--Copyright 1977, Biological Abstracts, Inc.
W77-07428

GAS BUBBLE DISEASE MORTALITY OF ATLANTIC MENHADEN AT PILGRIM NUCLEAR POWER STATION, APRIL, 1975,
Yankee Atomic Electric Co., Westborough, Mass. Environmental Engineering Dept.
R. A. Marcello, Jr.
Report prepared for Boston Edison Co., Boston, Massachusetts. Publish in: Marine Ecology Studies Related to Operation of Pilgrim Station, Semi-Annual Report 6, Vol. 2(6), 1975, 18 p., 3 fig, 1 tab., 11 ref.

Descriptors: Fishkill, *Mortality, *Thermal power, *Nuclear powerplants, Nuclear energy, Industrial wastes, Water temperature, *Thermal pollution, Fish disease, Supersaturation, Fish behavior, Marine fish, *Atlantic menhaden, On-site investigations.
Identifiers: *Gas bubble disease, Discharge channel, Thermal plume, Pilgrim Nuclear Power Station, Dissolved gases, *Discharge barrier net, Acoustic dispersion.

A mortality of Atlantic menhaden occurred in the discharge channel and thermal plume of the Pilgrim Nuclear Power Station Unit 1. Gas bubble disease was identified as the cause of this mortality. In April 1975, an additional mortality was observed in the discharge channel at Pilgrim Station. The events that transpired during the April 1975 episode are given. Data on dissolved oxygen saturation levels, fish behavior, mortality estimates, fish diversion attempts, were presented. (Katz)
W77-07429

EFFECT OF METHOD OF INTRODUCING WELL WATER ON THE GROWTH, BODY CHEMISTRY AND INCIDENCE OF EYE ABNORMALITIES OF JUVENILE BROWN AND RAINBOW TROUT,
Bureau of Sport Fisheries and Wildlife, Cortland, N. Y.
H. A. Poston, D. L. Livingston, and D. G. Hedrick.
The Progressive Fish Culturist, Vol. 35(4), October 1973, p. 187-190, 7 fig, 2 tab.

Descriptors: *Rainbow trout, *Fish diseases, *Fish hatcheries, *Brown trout, Growth rates, Water supply, Wells, Laboratory, *Supersaturation, *Flow rate, *Nitrogen, Mortality, Juvenile fish, Water.
Identifiers: *Eye abnormalities, Popeye, Tissue fat, *Nitrogen supersaturation, *Gas bubble disease.

Rainbow and brown trout fingerlings held in water dispensed through metal, single-aperture flow regulators were larger, showed better food conversion, and had fewer eye abnormalities than those held in water from multiperforated PVC pipe. The brown trout, although larger at the start, grew less, showed more popeye, and contained less tissue fat and more water at the end than rainbow trout. Chronic exposure of fish to nitrogen supersaturation is probably the cause of increased eye abnormalities. When nitrogen supersaturation exists, a system for reducing the level to near saturation is necessary to help minimize development of fish eye abnormalities. (Katz)
W77-07430

TOLERANCE OF SELECTED FISH SPECIES TO ATMOSPHERIC GAS SUPERSATURATION,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
D. H. Fickeisen, J. C. Montgomery, and M. J. Schneider.
Presented at American Fisheries Society, 103rd Annual Meeting, Orlando, Florida, September 6-12, 1973, BNWL-SA-4794, 13 p., 21 fig., 1 ref.

Descriptors: *Bioassay, Mortality, Laboratory tests, *Atmospheric gas, Supersaturation, *Fish disease, Salmonids, Gas chromatography, Bass, Bullheads, Catfishes, *Rainbow trout, Carp, Suckers, Animal pathology.
Identifiers: *Nitrogen supersaturation, *Gas bubble disease, *Tolerance, *Relative tolerance, Heart embolism, Subepidermal emphysema, Molecular sieve, Gas chromatography, Mountain whitefish, Smallmouth bass, Channel catfish, Black bullhead, Pumpkinseed, Bluegill, Largescale sucker, Northern squawfish.

Several fish species were collected in SE Washington, acclimated to 20C and 100-150% gas supersaturation, and exposed to high gas content waters (100-140% supersaturation) at 20C under standard acute bioassay conditions. The fish were monitored to determine death time and necropsyed to determine the cause of death. The species exhibited a differential tolerance to high gas levels with smallmouth bass more tolerant and salmonids less tolerant. Nearly all fish which died during the test exhibited signs of gas bubble disease, ranging from massive heart embolism to mild subepidermal emphysema. These signs were related to exposure time and to gas supersaturation levels. Gas concentrations were monitored by molecular sieve gas chromatography. (Katz)
W77-07431

SPILLWAY REDESIGN ABATES GAS SUPERSATURATION IN COLUMBIA RIVER,
Army Engineer District, Portland, Oreg., North Pacific Div.
For primary bibliographic entry see Field 5G.
W77-07432

THE EFFECT OF TEMPERATURE ON SIZE AND STRUCTURE-II. THE BODY MUSCULATURE OF CYCLOPS AGILIS (KOCH, SARS),
Trinity Coll., Dublin (Ireland). Dept. of Zoology.
E. Campbell, and J. N. R. Grainger.
Proceedings of the Royal Irish Academy, Vol. 75, Sec. B, No. 20, 1975, p 391-399, 4 tab, 23 ref.

Descriptors: Environmental effects, *Temperature, *Crustaceans, Size, Growth rates.
Identifiers: Musculature, Body size, *Cyclops agilis.

Body muscle fibres of adult Cyclops agilis were measured in animals reared at 10, 15, and 25 C. It was concluded that differences existing between muscles of animals reared at different temperatures lie in the differences in fibre diameter. This was greatest at 15C and the average 15C fibre contained more myofibrils than the 25 C muscle. Filament spacing measurements showed that there was markedly more contractile material in the 15 C as compared with the 25 C muscle. The 15 and 25 C results followed the general pattern of decreasing size with increasing rearing temperature but the 10 C did not. This anomaly was not explained. Sarcomere length and A-band length were constant. (Chilton-ORNL)
W77-07433

PRELIMINARY INVESTIGATIONS ON BIVALVES BIVALVIA OF THE DAM RESERVOIR AT GOCZALKOWICE,
Polish Academy of Science, Pszcyna. Lab. of Water Biology.
E. Krzyzanek.
Acta Hydrobiologica, Vol. 18, No. 1, p. 61-73, 1976. 7 fig., 4 tab., 15 ref.

Descriptors: *Mollusks, *Reservoirs, *Biomass, *Spatial distribution, Dominant organisms, Reservoir stages, Succession.
Identifiers: *Bivalves, *Goczalkowice Reservoir(Poland), Unio pictorum, Anodonta cygnea.

The role of bivalves in the Goczalkowice dam reservoir is investigated, focusing on their qualitative and quantitative composition, their biomass including shells and their age structure. A succession of occurence of macrofauna between 1956 and 1973 was shown, from small species of the genus Pisidium, through the genus Anodonta, to the genus Unio pictorum. Results indicate that the current dominating species is Unio pictorum, found mainly in the sandy bottom of the northern part of the reservoir. The second most numerous species, Anodonta cygnea, was found in the muddier bottom of the southern part of the reservoir. The second most numerous species, Anodonta cygnea, was found in the muddier bottom of the southern part of the southern part of the reservoir. Spatial distribution analysis showed that Unio pictorum occurred most numerously at a depth of 2 m while Anodonta cygnea distribution was heaviest at 6 m. It is estimated that there were 106 million bivalves with a biomass of 5038 tons, or 4 specimens of 20 dag biomass per sq m. Biometric measurements to determine age structure indicated that Anodonta cygnea had the largest number of specimens in the 8 to 10 year age class, while Unio pictorum and Unio tumidus were predominant in the 6 to 8 and 4 to 6 year age classes, respectively. The number of younger specimens increased at greater depths for both Anodonta cygnea and Unio pictorum. (Luedtke-Wisconsin)
W77-07440

NITROGEN, PHOSPHORUS, PARTICULATE AND COLLOIDAL CARBON CONTENT OF SEDIMENTING SESTON OF A HARD-WATER LAKE,
W. S. White, and R. G. Wetzel.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 330-339, 1975. 8 fig., 20 ref.

Descriptors: *Seston, *Sediments, *Nitrogen, *Phosphorus, *Calcium carbonate, Colloids, Suspension, Translocation, Primary productivity, *Michigan, *Lake sediments.
Identifiers: *Lawrence Lake(Mich), Sedimentation traps.

Seston, the living and non-living particularate material suspended in the pelagic region of a lake, was collected biweekly at 4-meter intervals for two years by means of an improved sedimentation trap in Lawrence Lake (southwestern Michigan). Lawrence is a 4.96 ha 12.6 m-deep hard-water lake located in a drainage basin of predominantly limestone deposits. Chemical analyses of the sedimenting seston indicated significant spatial and temporal changes. A marked displacement of phosphorus from the epilimnion into the metalimnion was found in mid-summer. High rates of calcium carbonate precipitation, induced by photosynthesis, facilitated nutrient removal to the hypolimnion. During fall overturn an average of .17 micrograms per square meter per day was resuspended. Total nitrogen content of the sedimenting seston changed throughout the year; a marked displacement to the hypolimnion occurred in late summer. Pronounced changes in the particularate organic carbon fraction, strongly related to primary productivity, were not as apparent as other seston parameters. More than a third of the calcium content is in the form of colloidal calcium carbonate that forms a major sink for inorganic and organic nutrients. (Harris-Wisconsin)
W77-07441

SUCCESSION RATES IN LAKE PHYTOPLANKTON COMMUNITIES,
N. J. Williams, and C. R. Goldman.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 808-811, 1975. 1 fig., 7 ref.

Descriptors: *Rates, *Lakes, *Phytoplankton, *Succession, Limnology, Biological communities, Persistence, Speciation, Biomass, Trophic level, Climatic zones, Primary productivity.
Identifiers: Lake Tahoe(Cal-Nev), Castle Lake(Cal), Clear Lake(Cal), Lake Victoria(Africa).

Discussion is centered on progressive changes in relative species composition of phytoplankton in five lakes which represent extremes and medians of production. Included were: (1) Lake Tahoe, an ultra-oligotrophic, subalpine warm monomictic lake; (2) Castle Lake, California, a dimictic, mesotrophic subalpine lake; (3) Clear Lake, California, a polymictic, lower-altitude productive aquatic environment; (4) Lake Victoria, Africa, representing equatorial regions; and (5) an arctic pond to represent conditions typical of polar latitudes. Comparison of succession rates for the five lakes demonstrated that the non-tropical lakes show significant seasonal variation in succession. Additionally, maximum succession rates occur after community independent environmental perturbations which are usually but not necessarily correlated with periods of high primary productivity. Finally, it was found that in the absence of disturbance succession rates decline and remain low, partly because of community dependent processes. Equations are given in the text for measuring rate of succession by calculating the change in the relative contribution of individual species to total biomass diversity. Notation is given for the fraction of total diversity attributable to a single species, and a succession rate index that measures the speed at which the community moves through diversity space where the dimensions are the proportion of total diversity contributed by a particular species. (Harris-Wisconsin)
W77-07442

SPATIAL AND TEMPORAL CHANGES IN THE PRIMARY PRODUCTIVITY OF LAKE TAHOE, CALIFORNIA-NEVADA BETWEEN 1959 AND 1971,
California Univ., Davis. Inst. of Ecology.
C. R. Goldman, and E. de Amezaga.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 812-825, 1975. 7 fig., 2 tab., 24 ref.

Descriptors: *Primary productivity, *Trophic level, *Urbanization, Lakes, Phytoplankton, Social impact, Human population, Sewage disposal, Nutrients, Euphotic zone, Littoral, California, Nevada, Eutrophication.
Identifiers: *Lake Tahoe(Cal-Nev).

Intensive study of Lake Tahoe during 1967-71 and comparisons made with 1959-60 data show a dramatic increase in primary productivity for this remarkably blue and transparent alpine lake, a measure of increased cultural eutrophication that continues despite steps taken to export sewage from the lake's basin. During the latter period primary productivity increased 25.6% and this increase rises to 51% if compared with the 1959-60 data. It is assumed that the rapid build-up population around the lake in recent years have caused soil and vegetation disturbances which have replaced the nutrients that formerly were derived from treated sewage. The euphotic zone in Lake Tahoe often exceeds 100 m depth, and maximum phytoplankton may occur as deep as 50-75 m. The vertical profile is established in early December with a single production peak in the vicinity of 50 m. As stratification develops the unimodal productivity curve is transformed into a bimodal one which persists through the rest of the season. A trend is seen in which the seasonal maximum in productivity is retarded. Synoptic studies show that pelagic phytoplankton productivity has steadily increased relative to productivity in the littoral zone. Although the latter zone contributes only 10% of the lake primary productivity, it is visibly the greatest evidence of eutrophication in Lake Tahoe. (Harris-Wisconsin)
W77-07443

EFFECT OF DDT ON PHOTOSYNTHESIS OF SELENSTRUM CAPRICORNUTUM,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
S. S. Lee, S. C. Fang, and V. H. Freed.
Pesticide Biochemistry and Physiology, Vol. 6, No. 1, p. 46-51, 1976. 2 fig., 1 tab., 29 ref. PHS ES-00210, R01 ES00654-01.

Descriptors: *DDT, *Chlorophyta, *Photosynthesis, Algae, Chlorinated hydrocarbon pesticides, Path of pollutants, Carbon cycle, *Eutrophication, Water pollution effects.
Identifiers: Selenastrum capricornutum.

The effect of the chlorinated hydrocarbon DDT on carbon assimilation of a green alga, Selenastrum capricornutum, found in eutrophic freshwaters, was studied. Results indicated that DDT concentrations between 3.6 and 36 ppb (the latter approaching DDT concentration in polluted water) inhibited the incorporation of carbon-14 into both ethanol-soluble fractions and ethanol-insoluble fractions. Inhibition of carbon dioxide fixation was greater as the exposure of algae to DDT increased. Kinetic studies of photosynthetic carbon dioxide fixation indicated that DDT stimulated the incorporation of carbon-14 into glycolic acid, a major compound of photorespiration, and caused the concomitant suppression of flow of carbon-14 into aspartic acid, a major component of the C4-dicarboxylic acid pathway. The DDT shift from an efficient pathway into an inefficient pathway was interpreted to be through interruption of cyclic photophosphorylation. (Luedtke-Wisconsin)
W77-07444

A MODEL OF THE PHOSPHORUS CYCLE AND PHYTOPLANKTON GROWTH IN SKAHA LAKE, BRITISH COLUMBIA, CANADA,
W. M. Fleming.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 229-240, 1975. 5 fig., 2 tab., 22 ref.

Descriptors: *Trophic level, *Phosphorus, *Model studies, Eutrophication, Phytoplankton, Simulation analysis, Lakes, Dissolved oxygen, Water quality, Primary productivity, Diffusion, Sedimentation, *Canada, Cycling nutrients.
Identifiers: *Skaha Lake(British Columbia), *Phosphorus cycle.

A simulation model is described which shows that in measuring the phosphorus cycle in Skaha Lake (British Columbia), total phosphorus is a useful indicator for the prediction of trophic states. Difference equations and a daily time scale are used in a mass balance model which accounts for the dynamic stratification regime of the lake. A series of submodels detail total phosphorus movement between the epilimnion, hypolimnion and sediments. An eddy diffusion submodel predicts loading from the hypolimnion to the epilimnion which can equal external loading for short periods in the summer. A phosphorus regeneration submodel predicts organic sedimentation on the basis of primary production and inorganic sedimentation from adsorption considerations. A regeneration submodel considers temperature-related decomposition rates of sedimented phosphorus. A primary production submodel accounts for temperature, light and phosphorus dependency, as well as respiration, grazing, sinking and advection losses. Based on known phosphorus loading and limnological data from three years of study, reasonable agreement was found between real and simulated total phosphorus concentration, phytoplankton biomass and hypolimnetic dissolved oxygen. (Harris-Wisconsin)
W77-07445

PREDICTING THE IMPACTS OF PHOSPHORUS MANAGEMENT POLICIES ON THE EUTROPHICATION OF SKAHA LAKE, BRITISH COLUMBIA, CANADA,
W. M. Fleming, and J. G. Stockner.
Verhandlungen Internationale Vereiningung Limnologie, Vol. 19, Part I, p. 241-248, 1975. 4 fig., 1 tab., 8 ref.

Descriptors: *Eutrophication, *Trophic level, *Phosphorus, *Simulation analysis, *Phytoplankton, *Projections, Model studies, Water quality control, Tertiary treatment, Dissolved oxygen, Lakes, *Canada, Management.
Identifiers: *Skaha Lake(British Columbia).

Probable effects of four alternative phosphorus management policies on Skaha Lake (British Columbia) are assessed, using 20 years of hydrologic data and the eutrophic conditions of 1970 as a starting point. Using the first simulation, with no phosphorus removal and no increase in loading over the 20-year period, phytoplankton blooms will increase in intensity and hypolimnetic dissolved oxygen will approach zero while phosphorus concentrations will exceed 60 microgram/l. With 60% removal of municipal phosphorus and conditions of either high or low economic growth, the eutrophic conditions of 1970 are reached within 12-14 years. Algal blooms and hypolimnetic dissolved oxygen deficits are particularly serious during dry years. With 100% municipal phosphorus removal, trophic conditions appear to improve significantly, with the possibility of minor algal blooms during only dry years. The simulation uses a model previously made of the phosphorus-phytoplankton system in a British Columbia lake, which showed that total phosphorus can be a useful indicator for the prediction of trophic states. Skaha Lake is dimictic and has an average water residence time of 1.2 years. Maximum depth is 57 m, mean depth is 28 m, length is 11.9 km and width is 2.4 km. Total phosphorus at spring mixing is usually greater than 30 micrograms. Loading generally exceeds 1 gram per square meter per year and the hypolimnetic oxygen depletion rate is greater than .05 mg per square centimeter per day. (Harris-Wisconsin)
W77-07446

SUB-THERMOCLINE BIOMASS CONCENTRATION DETECTED BY TRANSMISSOMETER IN LAKE SUPERIOR,
N. H. F. Watson, K. P. B. Thomson, and F. C. Elder.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 682-688, 1975. 2 fig., 2 tab., 10 ref.

Descriptors: Instrumentation, *Lake Superior, *Thermocline, *Light penetration, *Telemetry, *Biomass, Transmissivity, Zooplankton, Phytoplankton, Euphotic zone, Limnology, Onsite data collections, Suspension, Sampling, Eutrophication, Bioassay, Pollutant identification.
Identifiers: *Transmissometers, *Sub-thermocline.

A Martek Transmissometer (Model XMS) was used on Lake Superior study cruises in 1973 to measure the optical beam attenuance or transmittance, referenced to a clear air path, as a function of depth. The measured transmittance is dependant on the scattering due to particles in suspension as well as the absorption from dissolved substances and any absorption due to the particles themselves. During September, transmittance profiles showed a marked minima at about 20-25 m depth over very large areas of Lake Superior. Vertical zooplankton hauls with nets were frequently clogged with fine yellowish-brown material at stations where this layer of low transmission was extensive. Analyses which followed subsequent sampling indicated considerably more chlorophyll a in the layer of minimum transparency than in the upper 20 m. At some stations concentrations were up to four times as high at 25-30 m as in the 0-20 m stratum. This indicated that the bulk of the material causing the transmission minimum was of algal origin. A conclusion is postulated that considerable quantities of phytoplankton algae may accumulate at depths just below the thermocline and the bottom of the photic zone in deep, large lakes. Estimates of production of such bodies of water based on synoptic surveys of surface or mean epilimnion concentrations of phytoplankton biomass as suggested by other research may underestimate the production considerably. (Harris-Wisconsin)
W77-07447

SYNERGISTIC EFFECTS OF PHOSPHATE AND MANGANESE ON GROWTH OF LAKE SUPERIOR ALGAE,
J. Shapiro, and G. E. Glass.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 395-404, 1975. 6 fig., 2 tab., 7 ref.

Descriptors: *Lake Superior, *Manganese, *Phosphates, *Algae, Iron compounds, Lakes, *Growth rates, Mine wastes.
Identifiers: *Taconite tailings, *Synergistic effects, Biostimulants.

Continuing earlier research aimed at assessing effects of the wastes from an iron ore (taconite) processing plant on Lake Superior, further evidence is presented that taconite tailings do stimulate growth of the lake's native algae. Evidence is also shown that both manganese and phosphate are limiting elements in the lake; that phosphate and manganese are synergistic in their effects as are phosphate and taconite; and that the stimulatory agent in taconite is in fact manganese, addition of which to the lake probably makes Superior mush more responsive to phosphate that may enter it from other sources. Approximately 60,000 metric tons of taconite waste enter Superior every day near its western end. About 40% of the wastes are less than 44 microns in size, considerable quantities find their way throughout the western arm of the lake. The combined findings are also important because they demonstrate the combined effect of manganese and phosphate or taconite and phosphate in combination is very much greater than their individual effects. The significance of the findings is that; while the Lake Superior watershed is relatively uninhabited today, with consequently only a relatively small inflow of phosphate into the lake, increases in population and development in the future would increase the degree of synergism between the taconite wastes and newly-added phosphate. Dramatic increases in nuisance algal growth could well result. (Harris-Wisconsin)
W77-07448

PLUTONIUM IN THE LAURENTIAN GREAT LAKES: COMPARISON OF SURFACE WATERS,
M. A. Wahlgren, and D. M. Nelson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 317-322, 1975. 1 fig., 4 tab., 12 ref.

Descriptors: *Great Lakes, *Radioisotopes, *Lake Michigan, *Lake Erie, *Lake Huron, *Lake Ontario, *Lake Superior, *Fallout, *Radioactive wastes, Cesium, Water pollution sources, Trace elements, Turnovers, Distribution patterns, Plankton, Strontium radioisotopes, Pollutant identification.
Identifiers: *Plutonium.

Results of studies of plutonium in Lake Michigan suggest that biological processes are significant factors in determining the turnover time for this element in Great Lakes waters. Studies of plutonium fallout in the lake, which is essentially a closed system, have demonstrated that only about 3% of the estimated cumulative deposition is retained in the water column, and that winter mixing results in a homogeneous distribution of radionuclides in the water column by spring. In an experiment that assumed similar mixing behavior in the other Great Lakes, surface water and plankton samples were measured from all five lakes in 1973. The range in plutonium concentrations over the five lakes was remarkably narrow in view of the diverse area-to-volume ratios and outflow characteristics of the lakes. Average concentrations were about .6 fCi/l in Superior, Michigan and Huron and .2 fCi/l in Erie and Ontario. Most-rapid removal of plutonium and cesium was in the shallow and eutrophic Lake Erie western basin. A consistent relationship between plutonium concentrations in water and in plankton has been observed in all five lakes, suggesting equilibrium between aqueous and sorbed plutonium. The concentration of plutonium in the Lake Michigan epilimnion is depleted rapidly during early summer but returns to nearly its previous level by the following spring. (Harris-Wisconsin)
W77-07449

PHOTOSYNTHETIC RATES IN LAKE SUPERIOR,
J. Verduin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 689-693, 1975. 1 fig., 1 tab., 3 ref.

Descriptors: *Lake Superior, *Photosynthesis, *Water sampling, *Estimating, Acidity, Alkalinity, Acid-base equilibrium, Euphotic zone, Primary productivity, Pollutant identification, Bioassay.
Identifiers: *Photosynthetic rates.

Determination was made of photosynthetic rates by three separate techniques on Lake Superior during a cruise in the summer of 1973: (1) carbon-14 uptake rates in clear and dark bottles; (2) change in acidity-alkalinity in clear and dark bottles; and (3) change in acidity-alkalinity between early morning and late afternoon as derived from acid-alkaline balance as compared with depth profiles in the open lake. Photosynthetic yields revealed large discrepancies among these three methods. Assuming that clear vs. dark bottle data represents the average yield in the euphotic zone (36 meters) and that the photoperiod is 14 hours, then the first method yields 14 millimoles per square meter per day, the second method yields 111 and the third method yields 200. Because practically all Lake Superior productivity data in the literature are based on carbon-14 data, it seems likely that the estimates of the degree of oligotrophy of the lake have been biased by the low photosynthetic yields obtained by this method. (Harris-Wisconsin)
W77-07450

INFLUENCE OF THE DRAINAGE BASIN ON THE EUTROPHICATION OF THE A-MESOTROPHIC LAKE PIASECZNO AND DISEUTROPHICATION OF THE POND LAKE BIKCZE,
Instytut Przyrodniczych Podstaw, Lublin (Poland). Produkeji Roslinnej AR.
I. Wojciechowski.
Acta Hydrobiologica, Vol. 18, No. 1, p. 23-52, 1976. 10 fig., 3 tab., 20 ref.

Descriptors: *Eutrophication, *Watersheds(Basins), Nutrient removal, Mesotrophy, Surface runoff, Subsurface runoff, Runoff, Lakes, Ditches, Embankments, Drainage engineering, Nutrients, Bogs, Humic acids, Drainage basins.
Identifiers: Lake Piaseczno(Poland), Lake Bikcze(Poland), *Lake renewal.

The eutrophic influence of the drainage basin on lakes in the Leczynsko-Wolodawskie Lake District was studiied and a method and the effect of isolating one of them from its drainage basin was ivestigated. It was found that fertilization of Lake Piaseczno and Lake Bikcze occurred only through surface and groundwater runoff from the drainage basin, depending on the balance of precipitation and water evaporation. During recent years, Lake Piaseczno has been marked by eutrophication, while a rapidly proceeding reverse tendency has been observed in nearby Lake Bikcze. Eutrophication inhibition in the latter resulted from its being isolated from its drainage basin by surrounding the lake with earth embankments and a ditch deeper than the groundwater level. Dissolved nutrients running off toward the lake from the drainage basin were carried beyond the lake. Blanket peat bogs left within the circumference of ditches were gradually transformed into raised peat bogs as the fertilizing waters were cut off. This supplied the lake with increased amounts of humic acids whose particles absorbed mineral salt cations dissolved in the water, causing diseutrophication of the lake. These mechanisms of inhibiting eutrophication and inducing diseutrophication may be applicable to other closed lakes in a similar climate, provided no discharge of sewage takes place. (Luedtke-Wisconsin)
W77-07452

EFFECT OF ZOOPLANKTON GRAZING ON PHOTOSYNTHETIC ACTIVITY AND COMPOSITION OF PHYTOPLANKTON,
Z. M. Gliwicz.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1490-1497, 1975. 4 fig., 1 tab., 13 ref.

Descriptors: *Photosynthesis, *Phytoplankton, Grazing, *Zooplankton, Tropical regions, Regression analysis, Biomass, Lakes.
Identifiers: Gatun Lake(Panama Canal Zone), Madden Lake(Panama Canal Zone).

Whether zooplankton grazing can be a stimulus for plankton primary production was investigated in two tropical reservoirs in the Panama Canal Zone (Gatun Lake and Madden Lake) and in a Polish temperate pond heated by power plant effluents. Multiple regression analysis based on light, temperature, nutrient income from the drainage basin and from deeper lake layers, light utilization efficiency, intensity of nutrient recycling, zooplankton grazing, the share of nannoplankton in the phytoplankton standing crop, efficiency of nutrient utilization by algae, and species diversity was utilized to determine which parameters most affect plankton photosynthetic activity. Only two factors--the quantity of phytoplankton biomass and the grazing intensity by filter feeding zooplankton--were significant. It was evident that phytoplankton photosynthesize more actively when their biomass is lower not only because of a weaker self-shading effect, but also because a smaller amount of nutrients is internally retained, thus enhancing the amount of nutrients available for algal growth. Consequently, more intensive grazing reduces the algal standing crop and the amount of nutrients retained, with resultant faster algal decomposition, and acceleration of nutrient regeneration, which, in turn, produces more efficient photosynthetic production. (Auen-Wisconsin)
W77-07453

COMPARISON OF PRIMARY PRODUCTIVITY (14C) PER UNIT BIOMASS BETWEEN PHYTOPLANKTON AND PERIPHYTON IN THE OTTAWA RIVER NEAR OTTAWA, CANADA,
A. S. Rosemarin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1584-1592, 1975. 4 fig., 2 tab., 28 ref.

Descriptors: *Primary productivity, *Phytoplankton, *Periphyton, Biomass, Standing crops, *Canada, Carbon cycle.
Identifiers: *Ottawa River(Ontario).

The relative contribution of periphyton and phytoplankton to primary productivity in the Ottawa River was investigated near Ottawa, Canada by comparing biomass and the P/B ratio. The range between the seasonal minimum and maximum for phytoplankton was approximately 100-fold and that for periphyton 10,000-fold. The annual mean for phytoplankton biomass was 2.6 mg sq m while that for periphyton at 0.1 m depth was 14,000 mg/sq m and at 0.5 m depth, 2600 mg sq m. The P/B ratio for phytoplankton consistently exceeded that for periphyton; over the sampling year, that for phytoplankton was 27 and for periphyton 0.07. The data showed that the relatively-low periphyton P/B value is caused by high periphyton biomass, which was three orders of magnitude greater than that for phytoplankton. However, the periphyton and phytoplankton productivity values were of the same order of magnitude. It was evident that phytoplankton are the major primary producers. In the littoral zone periphyton are the dominant primary producers in terms of productivity and biomass even though the periphyton P/B is two orders of magnitude lower than that for the phytoplankton. The major conclusion is that the phytoplankton have much higher carbon turnover rates than the periphyton. (Auen-Wisconsin)
W77-07454

EXPERIMENTAL SEDIMENT ADDITION STUDIES ON THE HARRIS RIVER, N.W.T., CANADA: THE EFFECT ON MACROINVERTEBRATE DRIFT,
D. M. Rosenberg, and A. P. Wiens.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1568-1574, 1975. 1 fig., 3 tab., 8 ref.

Descriptors: *Spatial distribution, *Sedimentation, *Benthic fauna, *Suspended load, *Canada, On-site investigations, Analytical techniques, Model studies, Invertebrates.
Identifiers: *Harris River(NWT), Macroinvertebrate drift.

In this first of a series of studies on the effects of increased suspended sediment concentrations on various aspects of benthic macroinvertebrtes, the extent of macroinvertebrate drift due to various sediment loadings was investigated. The experiments were conducted in a segment of the Harris River, Northwest Territories (Canada), with sediment additions in concentrations ranging from 10 to 500 mg/l. Sand-sized particles (2 to .05 mm) composed approximately 25% of bankside sediment was used; the remainder was composed of approximately 50% silt (.05 to .002 mm) and 25% clay (<.002 mm). The total weight of sediment added during each experiment ranged from 2.4 to 26.3 kg or .05 to 2.9 kg sq m of stream bottom. Preliminary results of the investigation of the responses of individual macrobenthic taxa to various weights of sediment used showed that the

number of Chironomidae in the drift always increased with sediment addition. However, Ephemeroptera, Simuliidae, and Hydracarin were inconsistent in their responses to sediment additions. The least difference in mean numbers of macrobenthos drifting during control and sediment addition periods was at an intended suspended sediment concentration of 250 mg/1; the greatest was at 100 mg/1. The drift is not quantified in this research due to insufficient data on symbiotic interactions. (Auen-Wisconsin)
W77-07455

THE VERTICAL DISTRIBUTION OF PLANKTON ROTIFERS IN A SMALL ALPINE LAKE WITH A SHARP OXYGEN DEPLETION (LUNZER OBERSEE),
A. Ruttner-Kolisko.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1286-1294, 1975. 7 fig., 8 ref.

Descriptors: *Rotifers, *Oxygen sag, *Spatial distribution, Vertical migration, Ecological distribution, Behavior, Europe, Diel migration, Alpine, Lakes.
Identifiers: *Lunzer Obersee(Austria), *Alpine lakes.

The vertical distribution of planktonic rotifers was studied in relation to oxygen depletion in a small Austrian alpine lake, the Lunzer Obersee. Although unaffected by humans, the lakes's oxygen regime has changed in the last 30 years when the whole water column was oxygenated during the autumn turnover, while in recent years the bottom 3-4 meters remained practically oxygen-free. Among the seven plankton species which presently occur, Keratella cochlearis dominates the winter plankton completely, forming two maxima-- a large one in the upper layer and a smaller but very distinct maxima in the deeper deoxygenated zone. The two major constituents of winter plankton, observed in 1943, Filinia terminalis and Keratella testudo, both with a maximum at a very low oxygen content, are now reduced to a few individuals per liter. During summer stratification the rotifer diversity has changed to a nearly uniform population of Polyarthra dolichoptera, which shows a similar vertical distribution and about an equal density as K. cochlearis in winter. At turnover time, K. cochlearis dominates, but a variety of other species, even greater than in 1943, coexist. The vertical distribution pattern is a characteristic ecological feature which is maintained throughout the whole seasonal appearance of a particular species. The rotifers appear to respond to oxygen depletion by use of oxygen diffusion, vertical migration, and reduced metabolism. (Auen-Wisconsin)
W77-07456

COMPOSITION AND DYNAMICS OF THE BOTTOM ANIMALS IN THE LITTORAL ZONE OF DOJRAN LAKE, MACEDONIA,
J. A. Sapkarev.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1339-1350, 1975. 11 fig., 4 tab., 24 ref.

Descriptors: *Benthos, *Littoral, Varieties, Eutrophication, Aquatic animals, Animal populations, Dominant organisms, Europe, *Bottom sediments, *Lakes.
Identifiers: *Lake Dojran(Yugoslavia).

The density, species, seasonal dynamics and ecological distribution of the benthic animals in the littoral zone of eutrophic Lake Dojran, Macedonia (Yugoslvia), are described. The substrate of the littoral zone is composed mainly of fine sands, mud mixed with sand, and mud with detritus, but the greater portion is covered with dense macrophytic vegetation. The stony habitat contains the greatest variation, dominated by chironomids and leeches, which together with gastropods, oligochaetes and crustaceans, form the major community structure. The fine sand habitat (0-1 m depth) includes only six animal groups, dominated by oligochaetes and chironomids, followed by crustaceans and leeches; mayflies and caddisflies are represented by only one species each. The mud and sand habitat covered by macrophytes, located mainly between 1 and 3 m depth, contains the richest bottom fauna. At least 16 animal groups inhabited this community, but 13 oligochaete species and 8 crustacean species predominate, some reaching very high densities. The mud-detritus habitat, at 3-4.5 m depths, is relatively rich in bottom fauna; it contains at least 14 groups with the greatest number of species (9 oligochaetes and 7 chironomids). Seasonal variations in population densities and the species occupying each habitat are detailed. (Auen-Wisconsin)
W77-07457

THE LARVAL SPIRURID NEMATODES OF FRESH-WATER CRUSTACEANS: I. THE IDENTIFICATION AND THE EXAMINATION OF THEIR PATHOGENICITY,
Niigata Univ. (Japan). Dept. of Medical Zoology.
H. Hasegawa, T. Shiraki, and M. Kemmotsu.
Jpn J Parasitol 25(4), p 254-261, 1976.

Descriptors: *Nematodes, *Crustaceans, *Pollutant identification, Pathology, *Fish parasites, Shrimp, Larvae, Water pollution, *Parasitism.
Identifiers: Anisogamarus-Annandalei, Paratya-Compressa-Improvisa, Spirurid, Streptocara-Crassicauda.

Spirurid larvae parasitic on fresh-water crustaceans were identified to elucidate the possibility of their larva migrans. The larvae were collected from Paratya compressa improvisa (edible shrimp) and Anisogammarus annandalei. Larvae from A. annandalei developed to adults under the cuticular lining of the gizzard of chickens and ducklings when the larvae were orally inoculated, and they were identified as Streptocara crassicauda (Creplin, 1829) (Spiruridae: Acuariidae) by morphological characteristics. Larvae of P. compressa improvisa were not recovered in such experimentally infected avian hosts. Although infection to the birds indicated an apparent difference between the spirurid larvae from the 2 crustaceans, both larvae might be the same species because their morphological features were identical. To obtain positive evidence of their pathogenicity in the human body, the larvae were confined in the lumen of a surgically isolated intestinal tract - a small piece of intestine of rat or guinea pig ligated on oth ends and enclosed in the abdominal cavity of the host animal. The closed tract was investigated 3 or 6 h after the operation to confirm whether the larvae invaded the wall. Some larvae migrated to the intestinal wall or through it to the abdominal cavity. A kind of visceral larva migrans with these larvae may be caused by eating raw the intermediate hosts, such as some fresh-water shrimps or possible paratenic hosts, such as some fishes.--Copyright 1977, Biological Abstracts, Inc.
W77-07458

PIGMENT CYCLE IN A NORTH GERMAN LAKE,
H. Rai.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1220-1228, 1975. 3 fig., 2 tab., 15 ref.

Descriptors: Chromatography, Fluorometry, *Chlorophyll, *Measurement, *Pigments, *Degradation(Decomposition), Freshwater, Europe, Spatial distribution, *Lakes.
Identifiers: *Pluss See(Germany), Phaeopigments.

General distribution patterns of chlorophyll and phaeopigments were determined in Pluss See, germany, in an effort to overcome significant errors in chlorophyll estimations by fluorometric or trichromatic spectrophotometry sometimes caused by chlorophyll degradation products. The error depends on portions of the compounds relative to chlorophyll; if no corrections are made for phaeopigments the chlorphyll values would be greater by the amount of phaeopigments. The presence of even very small phaeopigment quantities will give erroneous results because they absorb light in the same spectral region as chlorophyll. Fluorometric studies in the lake indicated that the maximum chlorphyll concentration was usually in the euphotic zone and at times coincided with that of the phaeopigments. Phaeopigments maximally occurred above the portion of the water column where nutrient concentrations increased and chlorophyll degradation increased with percentage of depth. The seasonal cycle of chlorophyll and their degradation products showed a bimodal pattern with the phaeopigments consituting a significant fraction of the chlorophylls. It is concluded that post-lytic photochemical oxidation could be responsible to a large extent for chlorophyll decomposition products in lakes. Chlorophyll derivatives, especially phaeophytins and phaeophobides, have been detected chromatographically. (Auen-Wisconsin)
W77-07459

A SURVEY OF THE PHYSICAL AND CHEMICAL LIMNOLOGY OF LAKE TITICACA,
P. J. Richerson, C. Widmer, T. Kittel, and A. Landa.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1408-1503, 1975. 4 fig., 1 tab., 9 ref.

Descriptors: *Physical properties, *Chemical properties, *Lakes, *Tropical regions, South America, Thermal stratification, Water temperature, Secchi disks, Dissolved oxygen, Light penetration, Heat budget, Ions, Cations, Elevation, Basic data collections.
Identifiers: *Lake Titicaca(Peru-Bolivia).

Lake Titicaca is located in the southern tropics (Peru-Boliva) at an elevation of 3800 m, with a surface area of 7800 sq km. The annual range of monthly mean temperatures is small compared to the diurnal range, with minimum winter air temperatures rarely dropping below -5C. Evaporation accounts for 95% of the water lost from the lake; the rest flows out through the Rio Desaguadero. It is classified as a warm monomictic lake; the low concentrations of dissolved oxygen and high concentrations of silica at 150 to 200m before and after mixing indicate that the lake probably mixes down to at least 150 m. The lakes's annual heat budget is low and the heat balance is potentially sensitive to small variations of input and output from year to year. Secchi disk depth was 4.5-5 m in February, but as the rainy season ended, clarity increased and the Secchi depth reached 10.5 in August; with the onset of light spring rains in September, followed by increased phytoplankton biomass, Secchi depth decreased to 6 m by December. Extinction coefficients followed a pattern influenced by rainfall during the first half of the year and by photoplankton biomass during the latter half. Major ion concentrations varied only slightly. (Auen-Wisconsin)
W77-07460

SEDIMENT RESPIRATION IN SIX ITALIAN LAKES IN DIFFERENT TROPHIC CONDITIONS,
A. Provini.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1313-1318, 1975. 2 fig., 2 tab., 4 ref.

Descriptors: *Lake sediments, *Respiration, *Hypolimnion, *Biochemical oxygen demand, *Trophic level, Oxygen sag, Water temperature, Depth, Europe, Lakes.

PLUTONIUM IN THE LAURENTIAN GREAT LAKES: COMPARISON OF SURFACE WATERS,
M. A. Wahlgren, and D. M. Nelson.
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Descriptors: *Great Lakes, *Radioisotopes, *Lake Michigan, *Lake Erie, *Lake Huron, *Lake Ontario, *Lake Superior, *Fallout, *Radioactive wastes, Cesium, Water pollution sources, Trace elements, Turnovers, Distribution patterns, Plankton, Strontium radioisotopes, Pollutant identification.
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Results of studies of plutonium in Lake Michigan suggest that biological processes are significant factors in determining the turnover time for this element in Great Lakes waters. Studies of plutonium fallout in the lake, which is essentially a closed system, have demonstrated that only about 3% of the estimated cumulative deposition is retained in the water column, and that winter mixing results in a homogeneous distribution of radionuclides in the water column by spring. In an experiment that assumed similar mixing behavior in the other Great Lakes, surface water and plankton samples were measured from all five lakes in 1973. The range in plutonium concentrations over the five lakes was remarkably narrow in view of the diverse area-to-volume ratios and outflow characteristics of the lakes. Average concentrations were about .6 fCi/l in Superior, Michigan and Huron and .2 fCi/l in Erie and Ontario. Most-rapid removal of plutonium and cesium was in the shallow and eutrophic Lake Erie western basin. A consistent relationship between plutonium concentrations in water and in plankton has been observed in all five lakes, suggesting equilibrium between aqueous and sorbed plutonium. The concentration of plutonium in the Lake Michigan epilimnion is depleted rapidly during early summer but returns to nearly its previous level by the following spring. (Harris-Wisconsin)
W77-07449

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Descriptors: *Lake Superior, *Photosynthesis, *Water sampling, *Estimating, Acidity, Alkalinity, Acid-base equilibrium, Euphotic zone, Primary productivity, Pollutant identification, Bioassay.
Identifiers: *Photosynthetic rates.

Determination was made of photosynthetic rates by three separate techniques on Lake Superior during a cruise in the summer of 1973: (1) carbon-14 uptake rates in clear and dark bottles; (2) change in acidity-alkalinity in clear and dark bottles; and (3) change in acidity-alkalinity between early morning and late afternoon as derived from acid-alkaline balance as compared with depth profiles in the open lake. Photosynthetic yields revealed large discrepancies among these three methods. Assuming that clear vs. dark bottle data represents the average yield in the euphotic zone (36 meters) and that the photoperiod is 14 hours, then the first method yields 14 millimoles per square meter per day, the second method yields 111 and the third method yields 200. Because practically all Lake Superior productivity data in the literature are based on carbon-14 data, it seems likely that the estimates of the degree of oligotrophy of the lake have been biased by the low photosynthetic yields obtained by this method. (Harris-Wisconsin)
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Acta Hydrobiologica, Vol. 18, No. 1, p. 23-52, 1976. 10 fig., 3 tab., 20 ref.

Descriptors: *Eutrophication, *Watersheds(Basins), Nutrient removal, Mesotrophy, Surface runoff, Subsurface runoff, Runoff, Lakes, Ditches, Embankments, Drainage engineering, Nutrients, Bogs, Humic acids, Drainage basins.
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Descriptors: *Photosynthesis, *Phytoplankton, Grazing, *Zooplankton, Tropical regions, Regression analysis, Biomass, Lakes.
Identifiers: Gatun Lake(Panama Canal Zone), Madden Lake(Panama Canal Zone).

Whether zooplankton grazing can be a stimulus for plankton primary production was investigated in two tropical reservoirs in the Panama Canal Zone (Gatun Lake and Madden Lake) and in a Polish temperate pond heated by power plant effluents. Multiple regression analysis based on light, temperature, nutrient income from the drainage basin and from deeper lake layers, light utilization efficiency, intensity of nutrient recycling, zooplankton grazing, the share of nannoplankton in the phytoplankton standing crop, efficiency of nutrient utilization by algae, and species diversity was utilized to determine which parameters most affect plankton photosynthetic activity. Only two factors--the quantity of phytoplankton biomass and the grazing intensity by filter feeding zooplankton--were significant. It was evident that phytoplankton photosynthesize more actively when their biomass is lower not only because of a weaker self-shading effect, but also because a smaller amount of nutrients is internally retained, thus enhancing the amount of nutrients available for algal growth. Consequently, more intensive grazing reduces the algal standing crop and the amount of nutrients retained, with resultant faster algal decomposition, and acceleration of nutrient regeneration, which, in turn, produces more efficient photosynthetic production. (Auen-Wisconsin)
W77-07453

COMPARISON OF PRIMARY PRODUCTIVITY (14C) PER UNIT BIOMASS BETWEEN PHYTOPLANKTON AND PERIPHYTON IN THE OTTAWA RIVER NEAR OTTAWA, CANADA,
A. S. Rosemarin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1584-1592, 1975. 4 fig., 2 tab., 28 ref.

Descriptors: *Primary productivity, *Phytoplankton, *Periphyton, Biomass, Standing crops, *Canada, Carbon cycle.
Identifiers: *Ottawa River(Ontario).

The relative contribution of periphyton and phytoplankton to primary productivity in the Ottawa River was investigated near Ottawa, Canada by comparing biomass and the P/B ratio. The range between the seasonal minimum and maximum for phytoplankton was approximately 100-fold and that for periphyton 10,000-fold. The annual mean for phytoplankton biomass was 2.6 mg sq m while that for periphyton at 0.1 m depth was 14,000 mg/sq m and at 0.5 m depth, 2600 mg sq m. The P/B ratio for phytoplankton consistently exceeded that for periphyton; over the sampling year, that for phytoplankton was 27 and for periphyton 0.07. The data showed that the relatively-low periphyton P/B value is caused by high periphyton biomass, which was three orders of magnitude greater than that for phytoplankton. However, the periphyton and phytoplankton productivity values were of the same order of magnitude. It was evident that phytoplankton are the major primary producers. In the littoral zone periphyton are the dominant primary producers in terms of productivity and biomass even though the periphyton P/B is two orders of magnitude lower than that for the phytoplankton. The major conclusion is that the phytoplankton have much higher carbon turnover rates than the periphyton. (Auen-Wisconsin)
W77-07454

EXPERIMENTAL SEDIMENT ADDITION STUDIES ON THE HARRIS RIVER, N.W.T., CANADA: THE EFFECT ON MACROINVERTEBRATE DRIFT,
D. M. Rosenberg, and A. P. Wiens.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1568-1574, 1975. 1 fig., 3 tab., 8 ref.

Descriptors: *Spatial distribution, *Sedimentation, *Benthic fauna, *Suspended load, *Canada, On-site investigations, Analytical techniques, Model studies, Invertebrates.
Identifiers: *Harris River(NWT), Macroinvertebrate drift.

In this first of a series of studies on the effects of increased suspended sediment concentrations on various aspects of benthic macroinvertebrtes, the extent of macroinvertebrate drift due to various sediment loadings was investigated. The experiments were conducted in a segment of the Harris River, Northwest Territories (Canada), with sediment additions in concentrations ranging from 10 to 500 mg/1. Sand-sized particles (2 to .05 mm) composed approximately 25% of bankside sediment was used; the remainder was composed of approximately 50% silt (.05 to .002 mm) and 25% clay (<.002 mm). The total weight of sediment added during each experiment ranged from 2.4 to 26.3 kg or .05 to 2.9 kg sq m of stream bottom. Preliminary results of the investigation of the responses of individual macrobenthic taxa to various weights of sediment used showed that the

number of Chironomidae in the drift always increased with sediment addition. However, Ephemeroptera, Simuliidae, and Hydracarin were inconsistent in their responses to sediment additions. The least difference in mean numbers of macrobenthos drifting during control and sediment addition periods was at an intended suspended sediment concentration of 250 mg/1; the greatest was at 100 mg/1. The drift is not quantified in this research due to insufficient data on symbiotic interactions. (Auen-Wisconsin)
W77-07455

THE VERTICAL DISTRIBUTION OF PLANKTON ROTIFERS IN A SMALL ALPINE LAKE WITH A SHARP OXYGEN DEPLETION (LUNZER OBERSEE),
A. Ruttner-Kolisko.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1286-1294, 1975. 7 fig., 8 ref.

Descriptors: *Rotifers, *Oxygen sag, *Spatial distribution, Vertical migration, Ecological distribution, Behavior, Europe, Diel migration, Alpine, Lakes.
Identifiers: *Lunzer Obersee(Austria), *Alpine lakes.

The vertical distribution of planktonic rotifers was studied in relation to oxygen depletion in a small Austrian alpine lake, the Lunzer Obersee. Although unaffected by humans, the lakes's oxygen regime has changed in the last 30 years when the whole water column was oxygenated during the autumn turnover, while in recent years the bottom 3-4 meters remained practically oxygen-free. Among the seven plankton species which presently occur, Keratella cochlearis dominates the winter plankton completely, forming two maxima-- a large one in the upper layer and a smaller but very distinct maxima in the deeper deoxygenated zone. The two major constituents of winter plankton, observed in 1943, Filinia terminalis and Keratella testudo, both with a maximum at a very low oxygen content, are now reduced to a few individuals per liter. During summer stratification the rotifer diversity has changed to a nearly uniform population of Polyarthra dolichoptera, which shows a similar vertical distribution and about an equal density as K. cochlearis in winter. At turnover time, K. cochlearis dominates, but a variety of other species, even greater than in 1943, coexist. The vertical distribution pattern is a characteristic ecological feature which is maintained throughout the whole seasonal appearance of a particular species. The rotifers appear to respond to oxygen depletion by use of oxygen diffusion, vertical migration, and reduced metabolism. (Auen-Wisconsin)
W77-07456

COMPOSITION AND DYNAMICS OF THE BOTTOM ANIMALS IN THE LITTORAL ZONE OF DOJRAN LAKE, MACEDONIA,
J. A. Sapkarev.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1339-1350, 1975. 11 fig., 4 tab., 24 ref.

Descriptors: *Benthos, *Littoral, Varieties, Eutrophication, Aquatic animals, Animal populations, Dominant organisms, Europe, *Bottom sediments, *Lakes.
Identifiers: *Lake Dojran(Yugoslavia).

The density, species, seasonal dynamics and ecological distribution of the benthic animals in the littoral zone of eutrophic Lake Dojran, Macedonia (Yugoslvia), are described. The substrate of the littoral zone is composed mainly of fine sands, mud mixed with sand, and mud with detritus, but the greater portion is covered with dense macrophytic vegetation. The stony habitat contains the greatest variation, dominated by chironomids and leeches, which together with gastropods, oligochaetes and crustaceans, form the major community structure. The fine sand habitat (0-1 m depth) includes only six animal groups, dominated by oligochaetes and chironomids, followed by crustaceans and leeches; mayflies and caddisflies are represented by only one species each. The mud and sand habitat covered by macrophytes, located mainly between 1 and 3 m depth, contains the richest bottom fauna. At least 16 animal groups inhabited this community, but 13 oligochaete species and 8 crustacean species predominate, some reaching very high densities. The mud-detritus habitat, at 3-4.5 m depths, is relatively rich in bottom fauna; it contains at least 14 groups with the greatest number of species (9 oligochaetes and 7 chironomids). Seasonal variations in population densities and the species occupying each habitat are detailed. (Auen-Wisconsin)
W77-07457

THE LARVAL SPIRURID NEMATODES OF FRESH-WATER CRUSTACEANS: I. THE IDENTIFICATION AND THE EXAMINATION OF THEIR PATHOGENICITY,
Niigata Univ. (Japan). Dept. of Medical Zoology.
H. Hasegawa, T. Shiraki, and M. Kemmotsu.
Jpn J Parasitol 25(4), p 254-261, 1976.

Descriptors: *Nematodes, *Crustaceans, *Pollutant identification, Pathology, *Fish parasites, Shrimp, Larvae, Water pollution, *Parasitism.
Identifiers: Anisogamarus-Annandalei, Paratya-Compressa-Improvisa, Spirurid, Streptocara-Crassicauda.

Spirurid larvae parasitic on fresh-water crustaceans were identified to elucidate the possibility of their larva migrans. The larvae were collected from Paratya compressa improvisa (edible shrimp) and Anisogammarus annandalei. Larvae from A. annandalei developed to adults under the cuticular lining of the gizzard of chickens and ducklings when the larvae were orally inoculated, and they were identified as Streptocara crassicauda (Creplin, 1829) (Spiruridae: Acuariidae) by morphological characteristics. Larvae of P. compressa improvisa were not recovered in such experimentally infected avian hosts. Although infection to the birds indicated an apparent difference between the spirurid larvae from the 2 crustaceans, both larvae might be the same species because their morphological features were identical. To obtain positive evidence of their pathogenicity in the human body, the larvae were confined in the lumen of a surgically isolated intestinal tract - a small piece of intestine of rat or guinea pig ligated on oth ends and enclosed in the abdominal cavity of the host animal. The closed tract was investigated 3 or 6 h after the operation to confirm whether the larvae invaded the wall. Some larvae migrated to the intestinal wall or through it to the abdominal cavity. A kind of visceral larva migrans with these larvae may be caused by eating raw the intermediate hosts, such as some fresh-water shrimps or possible paratenic hosts, such as some fishes.--Copyright 1977, Biological Abstracts, Inc.
W77-07458

PIGMENT CYCLE IN A NORTH GERMAN LAKE,
H. Rai.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1220-1228, 1975. 3 fig., 2 tab., 15 ref.

Descriptors: Chromatography, Fluorometry, *Chlorophyll, *Measurement, *Pigments, *Degradation(Decomposition), Freshwater, Europe, Spatial distribution, *Lakes.
Identifiers: *Pluss See(Germany), Phaeopigments.

General distribution patterns of chlorophyll and phaeopigments were determined in Pluss See, germany, in an effort to overcome significant errors in chlorophyll estimations by fluorometric or trichromatic spectrophotometry sometimes caused by chlorophyll degradation products. The error depends on portions of the compounds relative to chlorophyll; if no corrections are made for phaeopigments the chlorphyll values would be greater by the amount of phaeopigments. The presence of even very small phaeopigment quantities will give erroneous results because they absorb light in the same spectral region as chlorophyll. Fluorometric studies in the lake indicated that the maximum chlorphyll concentration was usually in the euphotic zone and at times coincided with that of the phaeopigments. Phaeopigments maximally occurred above the portion of the water column where nutrient concentrations increased and chlorophyll degradation increased with percentage of depth. The seasonal cycle of chlorophyll and their degradation products showed a bimodal pattern with the phaeopigments consituting a significant fraction of the chlorophylls. It is concluded that post-lytic photochemical oxidation could be responsible to a large extent for chlorophyll decomposition products in lakes. Chlorophyll derivatives, especially phaeophytins and phaeophobides, have been detected chromatographically. (Auen-Wisconsin)
W77-07459

A SURVEY OF THE PHYSICAL AND CHEMICAL LIMNOLOGY OF LAKE TITICACA,
P. J. Richerson, C. Widmer, T. Kittel, and A. Landa.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1408-1503, 1975. 4 fig., 1 tab., 9 ref.

Descriptors: *Physical properties, *Chemical properties, *Lakes, *Tropical regions, South America, Thermal stratification, Water temperature, Secchi disks, Dissolved oxygen, Light penetration, Heat budget, Ions, Cations, Elevation, Basic data collections.
Identifiers: *Lake Titicaca(Peru-Bolivia).

Lake Titicaca is located in the southern tropics (Peru-Boliva) at an elevation of 3800 m, with a surface area of 7800 sq km. The annual range of monthly mean temperatures is small compared to the diurnal range, with minimum winter air temperatures rarely dropping below -5C. Evaporation accounts for 95% of the water lost from the lake; the rest flows out through the Rio Desaguadero. It is classified as a warm monomictic lake; the low concentrations of dissolved oxygen and high concentrations of silica at 150 to 200m before and after mixing indicate that the lake probably mixes down to at least 150 m. The lakes's annual heat budget is low and the heat balance is potentially sensitive to small variations of input and output from year to year. Secchi disk depth was 4.5-5 m in February, but as the rainy season ended, clarity increased and the Secchi depth reached 10.5 in August; with the onset of light spring rains in September, followed by increased phytoplankton biomass, Secchi depth decreased to 6 m by December. Extinction coefficients followed a pattern influenced by rainfall during the first half of the year and by photoplankton biomass during the latter half. Major ion concentrations varied only slightly. (Auen-Wisconsin)
W77-07460

SEDIMENT RESPIRATION IN SIX ITALIAN LAKES IN DIFFERENT TROPHIC CONDITIONS,
A. Provini.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1313-1318, 1975. 2 fig., 2 tab., 4 ref.

Descriptors: *Lake sediments, *Respiration, *Hypolimnion, *Biochemical oxygen demand, *Trophic level, Oxygen sag, Water temperature, Depth, Europe, Lakes.

Identifiers: Lake Montorfano(Italy), Lake Alserio(Italy), Lake Pusiano(Italy), Lake Segrino(Italy), Lake Annone(Italy), Lake Oggiono(Italy), *Italy.

Lake sediment respiration was measured in six Italian lakes, five eutrophic and one oligomesotrophic, to determine hypolimnetic oxygen depletion from the late winter overturn to the appearance of anoxic conditions between March-July. At the end of the overturn, oxygen uptake of the five eutrophic lakes was about 20 mg/sq m/hr; consumption in the oligomesotrophic lake equaled 12 mg/sq m/hr. Differences in algae, bacteria and invertebrate species seemed of secondary importance in affecting oxygen uptake, but oxygen concentration in the overlying water and temperature are the major forces in the sediment respiration process. The data suggest that the oxygen uptake rate of sediments is not a useful parameter for trophic classification for stratified lakes because the uptake rate is mainly dependent upon the physiographic and climatic characteristics. Biochemical oxygen demand (BOD) measurments in the deep waters were consistent with the trophic level and lake depth for each lake. Generally, anoxic conditions ranged in the same order as primary production capacity and mean water oxygen demand, except for Lake Pusiano; the latter is both the most productive and the deepest of the six lakes and thus has a larger hypolimnetic oxygen reserve and lower BOD of the hypolimnion. (Auen-Wisconsin)
W77-07461

MODELING THE ANNUAL THERMAL EVOLUTION OF MID-LATITUDE LAKES,
For primary bibliographic entry see Field 2H.
W77-07462

TRIPTON SEDIMENTATION IN EUTROPHIC LAKES--SAMPLE CORRECTION FOR THE RESUSPENDED MATTER,
A. Gasith.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 116-122, 1975. 2 fig., 3 tab., 11 ref.

Descriptors: *Sedimentation, *Tripton, *Suspension, *Sedimentation rates, *Analytical techniques, *Equations, Seston, Estimating, Lakes, Lake sediments, Pollutant identification, *Eutrophication.

Errors in estimations of tripton sedimentation measured by the suspended-containers technique, caused by interference by resuspended bottom deposits, can be eliminated by application of a correction formula based on differences between the organic fraction of tripton and that of resuspended sediment. In a control experiment for the evaluation of the correction technique, the recovery of the calculated tripton compared to the measured tripton was 95.6%. The correction formula allows extension of the technique to shallow bodies of water and eliminates the requirement for calm water conditions during tripton collections. The suggested correction can be applied only in cases of short-term trap exposure, preferably one day, during which grazing and decomposition of the material collected in the traps is presumed negligible. In deep lakes where the surface sediment is usually stratified, correction for occasional mixing and resuspension of bottom deposits may require more discrete sampling of the surface sediment for determination of the organic fraction of the resuspended matter. In addition to its application for suspended matter, the formula could be applied to distinguish between any two sources of organic matter which are significantly different in their organic content. (Harris-Wisconsin)
W77-07463

ALGAL SEDIMENTATION: THE CAUSE OF A DIATOM-BLUE-GREEN SUCCESSION,
R. Knoechel, and J. Kalff.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 745-754, 1975. 7 fig., 2 tab., 16 ref.

Descriptors: *Phytoplankton, *Succession, *Sedimentation, *Radioactivity techniques, *Primary productivity, Radiochemical analysis, *Canada, Anabaena, *Cyanophyta, *Diatoms, Trophic level, Dominant organisms, Lakes.
Identifiers: *Track autoradiography, *Lac Hertel(Quebec).

Application was made for the first time of track autoradiography to the study of aquatic primary production, in an examination of a system of succession where Tabellaria fenestrata (Lyngbye) Kuetzing is replaced by Anabaena plactonica Brunnth. Experiments were carried out in Lac Hertel, a small undisturbed naturally eutrophic lake near Montreal, Quebec. Carbon-14 content of individual cells of the slide-mounted material from samples was measured by track autoradiography, wherein a thick layer (greater than 30 microns) of photographic emulsion records the passage of a beta particle as a visible string of silver grains. Samples were concentrated on slides in a similar manner to those for cell counts and were then dipped in Kodak NRB-3 nuclear emulsion. Following exposure the slides were processed by Kodak K-19 developer. Track counts were normally made on at least 100 cells of Tabellaria per slide and on 25 cell sections of 20 Anabaena filaments. The results permitted calculation of daily growth rates of the individual species. The decline of the summer diatom population (Tabellaria) appears to be the result of a high sinking rate rather than a low production rate. In contrast the blue-green algal popultion(Anabaena) continues to increase due to a lower sinking rate. (Harris-Wisconsin)
W77-07464

POPULATION CHANGES IN THE AQUATIC FAUNA INHABITING THE BLADDERWORT, UTRICULARIA FLEXUOSA VAHL., IN A TROPICAL SWAMP, TASEK BERA, MALAYSIA,
R. P. Lim, and J. I. Furtado.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1390-1397, 1975. 3 fig., 2 tab., 13 ref.

Descriptors: *Monsoons, *Swamps, *Ecosystems, Biological communities, Aquatic plants, *Biomass, *Productivity, *Succession, Wet climates, Wet seasons, Wetlands, Foreign countries, Seasonal, Food chains, Standing crops, Population, Crustaceans, Fish, Larvae, Tropical regions.
Identifiers: *Tasek Bera Swamp(Malaysia), *Utricularia flexuosa Vahl, Tropical swamps.

A quantitative study of the macro- and microfauna inhabiting the bladderwort Utricularia flexuosa Vahl was made over a period of nine months in Tasek Bera, a Malaysian tropical swamp. An objective of the study was to learn how Tasek Bera, itself poor in nutrients, plankton and benthic organisms, can nevertheless support a diversified fish fauna which feeds on aquatic insects and zooplankton. It was found that curstaceans, fish, odonate larvae and dipteran larvae predominate in the biota associated with Utricularia. Similar dominant groups (with the exception of the fish) had been found in Ceratophyllum, a finely-dissected plant studied earlier. Seasonal fluctuations in the Utricularia mat and the populations of the biota associated with it were obviously unaffected by the twice-annual monsoons. Large portions of the mats were washed away at the beginning of each monsoon and only when the bladderwort re-established itself during the dry season did the periphyton and debris accumulate. These then provide the substrate for a detritrivorous and herbivorous microfauna, which in turn provided the substrate for a canivorous macrofauna. This community provided a concentrated food source for larger transient grazers and predators, especially fish. Thus, the rich standing crop of the Utricularia community contributed significantly to the Tasek Bera swamp ecosystem. (Harris-Wisconsin)
W77-07465

EFFECT OF NUTRIENT ENRICHMENT ON THE HETEROTROPHIC UPTAKE OF ORGANIC SOLUTES BY MICROORGANISMS,
K. J. Hall.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 280-285, 1975. 1 fig., 3 tab., 14 ref.

Descriptors: *Primary productivity, *Nutrients, *Kinetics, *Absorption, *Measurement, *Eutrophication, Food chains, Lakes, Microorganisms, Bays, *Lake Ontario.
Identifiers: *Bay of Quinte(Lake Ontario), Limnocorrals, Michaelis-Menten enzyme kinetics, *Organic solutes.

As part of an ongoing study of the effects of nutrient enrichment on the trophic dynamics of the food chain process in the aquatic environment, net uptake and mineralization of the radioactive solutes glucose, glycine and acetate by microorganisms in the water and sediments were measured in three limnocorrals located in the Bay of Quinte, Lake Ontario during summer 1973. The bay is a shallow arm on the north shore of the lake and is connected by a very narrow channel to the main lake. Little water is exchanged between the lake and the bay. The slow exchange, coupled with nutrient input from agriculture and urban development, has caused algal blooms in recent years. In the study, limnocorrals (plastic enclosures) were anchored in the bay in 4 m of water. Each was triangular, measuring 25 ft per side, and contained approximately 100,000 l of water. One limnocorral served as a control and the others were enriched with either phosphorus or nitrogen + phosphorus. Uptake rates and turnover times were determined using the techniques of modified Michaelis-Menten enzyme kinetics. Preliminary results indicate higher levels of heterotrophic activity in the nutrient-enriched limnocorrals. The sediment microorganisms demonstrated much higher levels of activity than the water column bacteria. (Harris-Wisconsin)
W77-07466

SEASONAL VARIATION IN SEDIMENT-WATER EXCHANGE OF NUTRIENT IONS IN LAKE ESROM,
L. Kamp-Nielsen.
Verhandlungen Internationale Verinigung Limnologie, Vol. 19, Part II, p. 1057-1065, 1975. 16 fig., 7 ref.

Descriptors: *Cycling nutrients, *Ion exchange, *Sediment-water interfaces, *Seasonal, Sedimentation rates, Temperature, Thermoperiodism, Oxidation-reduction potential, Foreign countries, Foreign research, Littoral, Profundal zone, Lakes, Ions.
Identifiers: *Lake Esrom(Denmark).

In an effort to study the relative importance of the processes involved in nutrient ion exchange under the influence of seasonal differences in temperature, rate of sedimentation and composition of the sediment surface, undisturbed sediment cores were collected each month for one year from the littoral and from the profundal zones in Lake Esrom, Denmark. Exchange rates were calculated for two week periods at the temperaturs found in the lake. Data for the seasonal variation in vertical distribution of temperature, pH, oxygen, primary production and other sedimentation data were obtained from another ongoing research project. Results showed that exchange rates of nutrient ions across the sediment surface are mainly governed by temperature and sedimentation rate and only to some smaller extent by the variation in redox conditions and pH. The spring maximum in primary production in March-April is followed by

a high rate of sedimantation from April 15 to June. Due to increasing surface and bottom temperature in this period the decomposition of the sedimented organic matter accelerates. This is reflcted in the maximum release in June of all the studied ions. The exchange between bottom water and profundal sediment is to some extent influenced by the redox conditions during the summer stagnation. However, during most of the year the profundal nutrient exchange follows the variation in temperature and sedimentation. The most distinct temperature depenpence is seen in the case of silicate exchange. (Harris-Wisconsin)
W77-07467

THE UTILIZATION OF THE GREEN ALGA DICTYOSPHAERIUM PULCHELLUM AS FOOD FOR CERTAIN CRUSTACEANS OF FRESH WATER PLANKTON,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
R. Zurek.
Acta Hydrobiologica, Vol. 18, No. 1, p. 53-59, 1976. 5 fig., 1 tab., 9 ref.

Descriptors: *Chlorophyta, *Crustaceans, *Feeding rates, *Nitrogen compounds, Foods, *Plankton, Growth rates, *Food chains, *Nutrients, Sewage, Fertilizers.
Identifiers: *Dictyosphaerium pulchellum, Nutrient value.

The nutritive value of the green alga Dictyosphaerium pulchellum was investigated as a food for Daphnia longispina, D. magna, Simocephalus vetulus, Scapholeberis nucronata (Cladocera, Phyllopoda), Notodroma monacha (Ostracoda), Macrocyclops fuscus (Cyclopoida, Copepoda), and Diatpmus sp. (Calanoida, Copepoda). D. pulchellum was selected because it develops very well in diluted sewage containing large amounts of nitrogen compounds. Out of the seven crustaceans tested only Daphnia magna consumed Dictyosphaerium pulchellum in an amount attaining almost 16% of its body weight. The other species consumed very little of the alga. The nutritive value of the green alga was evaluated on the basis of the assimilation index, Ca/W bar=(R2)(Cr)(2400))/W bar %, where R2 is the sum of the animals' activity after the excretion of food and of the activity of respirated carbon in impulse/hr/individual, Cr is the reverse of specific activity in milligrams of dry weight per impulse, and W bar is the mean dry weight of an animal in mg. Assimilation indices were less than 1% for all species suggesting poor suitability of the alga for the crustaceans examined. (Luedtke-Wisconsin)
W77-07468

UPWELLING IN A MODEL OF AN INTERMONTANE LAKE,
For primary bibliographic entry see Field 5B.
W77-07469

AN ORGANIC CARBON BUDGET FOR AN OLIGOTROPHIC LAKE IN NEW HAMPSHIRE, U.S.A.,
M. Jordan, and G. E. Likens.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 994-1003, 1975. 3 fig., 3 tab., 23 ref.

Descriptors: *Carbon cycle, *Lakes, *Trophic level, *Eutrophication, Limnology, *New Hampshire, Phytoplankton, *Oligotrophy, *Pollutant identification, Gas chromatography.
Identifiers: *Mirror Lake(NH), *Organic carbon budget, Dissolved inorganic carbon, Dissolved organic carbon, Fine particulate organic carbon.

A complete organic carbon balance is presented for Mirror Lake, a small (15 ha) lake with a mean depth of 5.57 m and a maximum depth of 10.9 m with a mountainous, granitic drainage basin. The water is nutrient-poor, slightly acid and oligotrophic. The lake is usually dimictic and is ice-covered from mid-December to mid-April. In summer the thermocline is at a depth of 4-5 m and oxygen concentrations in the hypolimnion are often less than 0.5 ppm. Dissolved inorganic carbon (DIC) ranges from 0.84 to 5.88 mg C/1. Dissolved organic carbon (DOC) and fine particulate organic carbon were determined with an infrared gas analyzer. DIC was determined by gas chromatography. Results of these and other budgetary measurements show that autochthonous sources represent 83% of the total organic carbon inputs for the lake. Phytoplankton are the major producers, accounting for 90% of autochthonous inputs. Fluvial DOC is the most important allochthonous carbon source(47%). Of the total carbon inputs, 83% are lost through respiration, 7% by sedimentation and 10% by fluvial outputs. Parts of the budget are considered tentative, awaiting further studies on the lake. (Harris-Wisconsin).
W77-07470

ALGAL PRODUCTIVITY OF NATURAL AND ARTIFICIALLY ENRICHED FRESH WATERS IN MALAYA,
J. L. Richardson, and L. T. Jin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1383-1389, 1975. 1 fig., 2 tab., 4 ref.

Descriptors: *Tropical regions, *Eutrophication, *Oligotrophy, *Fish farming productivity, Algae, Aquatic plants, Ponds, Photosynthesis, Electrical conductance, Soil types, Asia, Lakes.
Identifiers: *Malaya, Aquatic plant utilization.

Algal productivity in two natural lakes, several man-made reservoirs, fish culture ponds, and pools left by mining operations on the Malay Peninsula is described. The greatest contrasts were those between waters not intentionally enriched and those fertilized for fish culture. When unenriched by human activities, Mala yan waters have low algal production because local soils are mostly part granite, are highly leached and usually deep; this is in contrast to many other tropical areas that support productive lakes from young, volcanic soils and grassland wild animal habitats. Nutrient enrichment, however, has a marked effect on productivity. A pond fertilized for fish culture for three years more than doubled its conductivity and its algal production increased 14-fold. Rural inhabitants use both mining pools and specially-constructed shallow ponds for fish culture, and traditionally raise pigs and ducks as part of an integrated complex. Aquatic macrophytes are harvested from the pond and boiled down to form food for the pigs. Wastes from the sty are washed into the pond, promoting vigorous growth not only of macrophytes for the pigs but of algae which directly or indirectly feed the carp and ducks. Maximal production was recorded in a fish pond only 40 cm deep; rates near the surface were 18.7 mg oxygen/1/hr (gross) and 17.2 mg oxygen/1/hr (net). (Auen-Wisconsin).
W77-07471

POST-GLACIAL HISTORY OF MIRROR LAKE AND ITS WATERSHED IN NEW HAMPSHIRE, U.S.A.: AN INITIAL REPORT,
G. E. Likens, and M. B. Davis.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 982-993, 1975. 5 fig., 2 tab., 42 ref.

Descriptors: *Paleolimnology, *Sampling, *Cores, Lake sediments, *Lake basins, *New Hampshire, Sedimentation, Bottom sediments, Bottom sampling, Forest watersheds, Pollen, Glaciation, Pollutant identification.
Identifiers: *Mirror Lake(NH), Pollen analysis.

Analyses were made of a continous sediment core of 12.42 m length from near the center of Mirror Lake, New Hampshire, a small (15 ha) lake with a mean depth of 5.57 m and a maximum depth of 10.9 m with a mountainous, granitic drainage basin. The deposits represented an opportunity to quantify historical linkages between the lake and its terrestial watershed, using output data from the surrounding area. Samples of the sediment, carbon-14 dated at about 11,300 years old, were analyzed for organic carbon, total sulphur, phosphorus, and total calcium, magnesium, sodium, potassium, copper, zinc, aluminum and iron. Extractable amounts of the latter eight elements were determined by a separate technique. Pollen samples were also taken for analysis. As a result of analyses of the sample, the sediment profile of the lake was divided into four zones: Zone I, late glacial, extends from the bottom (1,242 cm) to about 1,125 cm and spans about 2,000 years (11,300-9,300 B.P.); Zone II, early post-glacial, extends from 1,125 cm to about 560 cm and spans about 4,500 years (9,300-4,800 B.P); Zone III, late post-glacial, extends from 560 cm to about 25 cm and spans about 4,600 years (4,800-200 B.P.); Zone IV, the recent cultural horizon, extends from 25 cm to the mud-water interface and spans about 200 years (200 B.P. to present). The fossil record of phytoplankton in the lake is presently being separately studied, in an effort to provide a better record of historical nutrient levels in the water. (Harris-Wisconsin).
W77-07472

THE STRUCTURE OF PHYTOPLANKTON ASSOCIATIONS IN LAKE TAHOE (CALIFORNIA-NEVADA),
P. J. Richerson, B. J. Dozier, and B. T. Maeda.
Verhandlungen International Vereinigung Limnologie, Vol. 19, Part II, p. 843-849, 1975. 5 fig., 19 ref. NSF GA-34099.

Descriptors: *Phytoplankton, *Biological communities, *Distribution patterns, *Environmental effects, Spatial distribution, Correlation analysis, California, Nevada.
Identifiers: *Lake Tahoe(Calif-Nev), Phytoplankton associations.

Phytoplankton associations and their diversity as related to the physical environment were investigated in Lake Tahoe and its Emerald Bay (essentially a separate lake, about 1/10th of the dimension of the main lake, connected over a 2.5 m-deep sill). These 1973 observations were a portion of a larger study to relate phytoplankton distribution as directly as possible to physical environmental conditions. Physical measurements included current speed, current fluctuations and temperature structure. Biological measurements included in-situ chlorophyll fluorescence and phytoplankton sample enumeration. Diversity spectra were analyzed by several techniques, including averaged and unaveraged methods. The observations confirmed the existence of spatial heterogeneity in phytoplankton associations. Even in the horizontal direction, patterns may exist on length scales ranging downward to about 200 m. The results were generally consistent both with the comparisons of chlorophyll and with turbulence measurements which showed divergence in the spectral form of chlorophyll and velocity variance at similar length scales. The cause for the lack of regular variation in phytoplankton community structure observed is obscure. (Auen-Wisconsin).
W77-07473

AREAL DISTRIBUTION AND STRATIGRAPHY OF DIATOMS IN THE SEDIMENTS OF LAKE SALLIE, MINNESOTA,
Geological Survey, Lakewood, Colo. Water Resources Div.; and Geological Survey, Denver, Colo. Geologic Div.
J. P. Bradbury, and T. C. Winter.
Ecology, Vol 57, No 5, p 1005-1014, 1976. 7 fig, 2 tab, 21 ref.

Descriptors: *Diatoms, *Ecology, *Eutrophication, *Lakes, *Sediments, Limnology, *Minnesota, Paleolimnology, Stratigraphy, Areal, Distribution.

Identifiers: *Lake Sallie(Minn), *Areal distribution.

The patterns of modern diatom sedimentation in presently eutrophic Lake Sallie, Minnesota, have aided in elucidating the trophic changes in the lake caused by man's activities since the 1870s. The modern sedimentation patterns were determined from a transect of surface sediment samples taken through littoral and profundal zones of the lake and the trophic history is interpreted from the diatom content of two lake-sediment cores. The transect shows that, in this lake, diatom valves are mostly deposited in the area of their living habitats and are not homogeneously redistributed by lake currents. Planktonic diatoms Stephanodiscus sp. cf. S. hantzschii, Stephanodiscus niagarae, and Melosira granulata dominate in the profundal sediments, and sessile Fragilaria species characterize the sediments beneath the littoral habitat. Fragilaria construens var. binodis prefers nutrient-rich water entering the littoral zone near the inflow of the Pelican River, a stream carrying secondary sewage effluent from the town of Detroit Lakes. The Diatom stratigraphy indicates that the benthic and planktonic diatom communities have changed in species composition and probably in productivity as a result of cultural eutrophication. Spring-blooming Stephanodiscus sp. cf. S. hantzschii dominates the post-settlement record. A core near the Pelican River inflow shows a marked increase in Fragilaria construens var. binodis that probably reflects increased nutrient levels during the most recent history of Lake Sallie. (Woodard-USGS)
W77-07481

USE OF QUANTITATIVE CORRELATIONS BETWEEN MICROORGANISMS FOR RIVER POLLUTION EVALUATION, (IN RUSSIAN),
Ministerstvo Melioratsii i Vodnogo Khozyaistva, Vilnius (USSR).
For primary bibliographic entry see Field 5B.
W77-07482

WIND CONTROL OF ALGAE GROWTH IN EUTROPHIC LAKES,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5G.
W77-07497

AN INVESTIGATION OF COLLOIDAL ORGANIC PARTICLES ISOLATED FROM DIFFERENT POPULATIONS OF BIVALVES,
For primary bibliographic entry see Field 5A.
W77-07498

ASPECTS OF ZOOBENTHOS ECOLOGY OF THE MACKENZIE DELTA, N.W.T.,
N. B. Snow, and P. Chang.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1562-1567, 1975. 1 fig., 3 tab., 6 ref.

Descriptors: *Deltas, *Benthic fauna, *Canada, Varieties, Aquatic insects, Mollusks, Copepods, Crustaceans, Invertebrates, Estuaries, Arctic, Natural gas, Oil spills.
Identifiers: *Mackenzie Delta(NWT).

The 13,000 sq km Mackenzie Delta in the Canadian Artic area is a complex of sinuous channels and approximately half a million lakes, 95% of which are flood plain lakes. This investigation represents a preliminary data base of the region's aquatic fauna and factors controlling their distribution and abundance. Some macrophyte, phytoplankton and zooplankton collections were also made. Concern for the area is generated by hazards resulting from oil and gas development spills. The channels are impoverished habitates dominated by chironomid, ceratopogonid and caddis larvae and oligochaetes. Lake mollusc species are dominated by pelecypods, except for one Pisidium species which was peculiar to turbid lakes, and P. ferrugineum which was only found in clear lakes, Castropods showed a distinct separation into clear and turbid lake forms. Only four species occurred in both lake types, with greater diversity in clear lakes. Caddis larvae were distinctly separated into lake and channel species. Phryganeids dominated in lakes and hydropsychids predominated in channels. Two species of tanypodine chironomids were ubiquitous, but Tanypus was only found in clear lakes. Tanytarsine chironomids attained maximun numbers in lakes but one Tanytarsus and a Paratanytarsus species are ubiquitous. A single Diamesine species was found in turbid waters only. The dominant copepoda, cladocera, molluscs and insects and their habitats are listed. (Auen-Wisconsin).
W77-07499

PRELIMINARY ESTIMATES OF PRODUCTION BY A CALANOID COPEPOD IN SUBTROPICAL LAKE SIBAYA,
R. C. Hart, and B. R. Allanson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1434-1441, 1975. 4 fig., 2 tab., 13 ref.

Descriptors: *Productivity, *Zooplankton, *Subtropic, *Copepods, Growth rates, Standing crops, *Africa, Estimating, Analytical techniques, Lakes.
Identifiers: *Lake Sibaya(South Africa), *Pseudodiaptomus hessei.

This production assessment of the copepod Pseudodiaptomus hessei represents an initial investigation of subtropical zooplankton productivity as exemplified in oligotrophic Lake Sibaya, South Africa. Data is given for egg development rates, duration of naupliar and copepodite instars, length-weight determinations, population age structure, standing stock and production. Mean standing crop of the 27-month investigation period was 5.704 mg dry wt/cu m and mean daily production was 2.458 and 0.634 mg dry wt/cu m/day, computed by Elster's and Winberg's methods respectively. Mean daily P/B ratios were 0.43 and 0.11. Seasonal changes in production of P. hessei correlate better with temperature than with chlorophyll, however an interaction of temperature and food availability is involved. Little is known of the subtropical or tropical zooplankton production. A 1971 study on Lake George, Uganda, reflects a highly eutrophic system unlike Sibaya, where the mean daily production of Thermocyclops hyalinus is more than 750 times as great as that of P. hessei on unit volume basis and nearly 140 times as great on unit area basis. The low P. hessei production in Lake Sibaya almost certainly reflects its inherent paucity, particularly of nitrogen and phosphorus, which lies on and is surrounded by recently exposed marine sands. (Auen-Wisconsin)
W77-07500

CHANGES IN PHYTOPLANKTON SPECIES COMPOSITION SINCE 1894 IN TWO LAKES IN EAST-HOLSTEIN, GERMANY,
B. Hickel.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1229-1240, 1975. 2 fig., 6 tab., 39 ref.

Descriptors: *Speciation, Phytoplankton, *Algae, *Biological communities, *Baseline studies, Foreign countries, Varieties, Eutrophication, Ecotypes, Lakes.
Identifiers: *Plussee(Germany), *Grosser Ploener See(Germany).

Data from two lakes in northern Germany are among the few examples of long-term phytoplankton investigations which enable a comparison of species composition over more than 50 years. The first plankton composition in Grosser Ploener See and in the Plussee, located in East-Holstein, Germany, were recorded in 1894 just before the onset of eutrophication. Comparisons are based on investigations during the years 1894-1908, 1921-1925 and 1929, and the most recent starting in 1964. These two lakes are naturally eutrophic and their trophic status has been further enhanced by agricultural runoff and from various other sources. Two tables list the phytoplankton species for the three investigation periods, showing marked changes in species composition and dominance. The number of species in the Plussee has decreased markedly within the last 80 years, but in the Grosser Ploener See it has remained almost constant (two species more than in 1893-1901). In the Plussee the number of chlorococcal green algae species has decreased whereas in the Grosser Ploener See they have increased. (Auen-Wisconsin)
W77-07501

THE EFFECT OF FOOD CONCENTRATION AND TEMPERATURE ON RESPIRATION AND EXCRETION IN HERBIVOROUS ZOOPLANKTON,
E. J. LaRow, J. W. Wilkinson, and K. D. Kumar.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 966-973, 1975. 3 fig., 1 tab., 20 ref. NSF AG-199, BMS 69-01147 A 09.

Descriptors: *Zooplankton, *Metabolism, *Respiration, *Water temperature, Food abundance, *Nitrogen, *Phosphorus, *Daphnia, Copepods, Statistical methods, New York, Lakes.
Identifiers: Excretion, Daphnia galatea mandotae, Diaptomus siciloides, *Lake George(NY).

Experiments are described which were designed to estimate effects of temperature and food concentrations on respiration and on nitrogen and phosphorus excretion for zooplankton, in the Lake George (N.Y.) ecosystem using Daphnia galatea mendotae and Diaptomus siciloides. The initial hypothesis was that respiration and excretion would directly reflect changes in feeding rates when organisms were exposed to different food concentrations. The latter have been shown to be curvilinear. However the resultant data were not curvilinear but linear in nature. The possible explanation for the linear response is that the experimental food levels were below the incipient level of food concentration. The organisms were starved for 48 hours prior to feeding experiments, causing them to feed at abnormally high rates for a short period of time. Hence what appears to be an exceptionally high incipient food concentration level is most likely an artifact due to the physiologically stressed organisms. Functional rates obtained in these experiments were generally greater than those reported in the literature but respiration values for all species, as well as the Daphnia excretion values, fell within the range of reported values. Comparative literature for limnoplankton respiration and excretion are presented, with data sets listing mean values for five replicates under each of the experimental conditions for both nitrogen and phosphorus excretion and respiration. (Auen-Wisconsin)
W77-07502

A SURVEY OF THE BIOLOGICAL LIMNOLOGY OF LAKE TITICACA,
C. Widner, T. Kittel, and P. J. Richerson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1504-1510, 1975. 4 fig., 2 tab., 17 ref.

Descriptors: *Primary productivity, *Tropical regions, *South America, Biological communities, Lakes, Zooplankton, Phytoplankton, Biomass, Silica, Limnology.
Identifiers: *Lake Titicaca(Peru), Bolivia.

Lake Titicaca (Peru) supports an abundant and varied flora and fauna and provides important food resources for a human population of nearly one million local rural residents. Rainbow trout and silversides also supply the restaurants of near-

by Peruvian and Bolivian cities. The lake is situated at 3800 m altitude, impounds 820 cu km of water, with a total surface area of 7800 sq km and a maximum depth of 280 m. Primary production, phytoplankton, and zooplankton populations were generally sampled at 100 m depths. Annual primary production was 529 g/C sq m and biomass production was calculated at a conservative 4.02 million metric tons. Changes in phytoplankton populations tended to reflect changes in production. Zooplankton populations, dominated by Boeckella titicacae, varied little throughout the year. The general pattern of biological processes in Lake Titicaca resembled those of tropical East African lakes, especially Lake Victoria, as the low seasonal variations dampen the usual annual patterns of higher latitude lakes. Productivity varied relatively little and seasonal changes in the phytoplankton and zooplankton were muted. The general stimulatory effect of tropic latitudes on species diversity seemed to be directly reversed in the zooplankton assemblages, perhaps because of a strong temporal component in zooplankton niches. (Auen-Wisconsin)
W77-07503

LAKE IZABAL, GUATEMALA,
M. M. Brinson, and F. G. Nordlie.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1468-1479, 1975. 5 fig., 4 tab., 16 ref.

Descriptors: *Lakes, *Tropical regions, *Limnology, Rainfall, Areal hydrogeology, Geology, Bathymetry, Hydrology, Hydrologic budget, Water chemistry, Plankton, Benthos, Water temperature, Varieties, Fishing, Primary productivity.
Identifiers: *Lake Izabal(Guatemala), Central America, Guatemala, Polymictic lakes.

Limnological characteristics of tropical, lowland, polymictic Lake Izabal (Guatemala) are described. The lake lies a few meters above sea level, in a broad, nearly flat plain, has a maximum depth of 16 m near the center; thus most of its volume is below sea level. Most of the 50 rivers and streams discharge into the lake's eastern, northern and southern edges, but the greatest volume of water is received through the massive Polochic Delta to the west. The lake's outlet is at the northeastern extremity, where the Rio Dulce continues the drainage to Amatique Bay in the Gulf of Hunduras on the Carribean Sea. Two mountain ranges delimit the Izabal hydrologic unit--the Sierra de las Minas and the Montanas del Mico life end-to-end and parallel the southern boundary, while the Sierra de Santa Cruz and Sierra Chama create the divide to the north. Details are given of climate, (including rainfall), geology, bathymetry and hydrology, water temperature, water chemistry, and the planktonic and benthic communities. Dominant net plankton are diatoms, cyanphytes, chlorophytes, cladocerans, copepods, and rotifers. Fishing is of local importance, but is threatened by overexploitation. The annual gross primary productivity was estimated at 1400 g oxygen/sq m during 1972. (Auen-Wisconsin)
W77-07504

ANNUAL CONTRIBUTION OF CARBON, NITROGEN AND PHOSPHORUS BY MIGRANT CANADA GEESE TO A HARDWATER LAKE,
B. A. Manny, R. G. Wetzel, and W. C. Johnson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 949-951, 1975. 7 ref. AEC AT-(11-1)-1599, COO-1599-84, NSF GB-28900X.

Descriptors: *Geese(Wild), *Nutrients, *Eutrophication, Waterfowl, *Carbon, *Nitrogen, *Phosphorus, Michigan, Canada goose, Animal wastes(Wildlife), Lakes.
Identifiers: *Non-point pollution, *Wintergreen Lake(Mich), Bird droppings.

The hypereutrophic condition of Wintergreen Lake, Michigan, is attributed to the droppings of more than 6000 migrant Canada geese which rest for 3-10 days during March, October, November and December on this 15-hectare hardwater lake. This nutrient source was measured on January 9-11, 1970 when the geese rested in a clearly-defined area on newly fallen snow covering the frozen lake. The average weight of the geese was 2.56 kg. During the three-day study each goose defecated an average dropping weighing 5.56 grams wet weight, or 1.17 g dry weight, 28 times per day. The average dropping contained, by weight: 79.30% moisture, 24.14% dry ash, 75.86% dry carbon, 4.38% dry nitrogen, and 1.34% dry phosphorus. Using a four-year average of 134,447 effective goose-use days, the average defecation rate of 28 times per goose, the average dry weight of a goose dropping of 1.17 g, and the average percentages of carbon, nitrogen, and phosphorus, migrant Canada geese were calculated to contribute 4404.8 kg dry weight of feces, 3341.24 kg of carbon, 192.92 kg nitrogen, and 59.02 kg phosphorus each year to Wintergreen Lake. These estimates do not include nutrients contributed to the lake by the year-round resident flock of 200 Canada geese or the more than 4200 mallard and diving ducks which use the lake each year. (Auen-Wisconsin)
W77-07505

UPTAKE AND RETENTION OF KUWAIT CRUDE OIL AND ITS EFFECTS ON OXYGEN UPTAKE BY THE SOFT-SHELL CLAM, MYA ARENARIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
W. C. Fong.
Journal of Fisheries Research Board of Canada, Vol. 33, No. 12, p. 2774-2780, 1976. 3 fig., 2 tab., 26 ref.

Descriptors: *Oil pollution, *Absorption, *Clams, Animal physiology, Respiration, Water pollution effects, *Canada, Oil spills, Water pollution effects.
Identifiers: Hydrocarbon effects, *Three Fathom Harbour(Nova Scotia).

This study, in which Mya arenaria from Three Fathom Harbour (Nova Scotia) were exposed to sea water to which crude oil had been added, tested the theory that the rate and extent of accumulation of petroleum hydrocarbons are affected by the lipid content of shellfish. Acute and prolonged exposure effects of oil on oxygen utilization by the soft-shell clams were also studied. The gills of this clam are capable of removing finely dispersed oil globules of 1-30 micrometer diameter from sea water along with food particles. Clams exposed to seawater concentrations of 90-380 microgram oil per liter for 10 days at 18C accumulated oil in their tissues. Concentrations incorporated are directly related to the lipid content of tissues. Approximately 6 mg oil per gram lipid was observed within the tissue of individual clams. Only one of three experiments demonstrated that Kuwait crude oil can cause significant increases in the respiratory rates of clams. Even these effects were only achieved in small clams (shell length 3.75-4.50 cm) after prolonged exposure to relatively high oil concentrations and high temperature (18C). Short-term exposure to high oil concentrations did not alter gill tissue respiration. Similarly, respiration rates of clams of various sizes were not significantly affected after exposure to low oil concentrations. (Auen-Wisconsin)
W77-07506

GRAZING EFFECTS ON NANNOPLANKTON IN GATUN LAKE, PANAMA,
E. T. Weers, and T. M. Zaret.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1480-1483, 1975. 2 tab., 5 ref. NSF GB 33396.

Descriptors: *Nannoplankton, *Grazing, *Zooplankton, Water chemistry, Food chains, Lakes.
Identifiers: *Gatun Lake(Panama Canal Zone), Ceriodaphnia cornuta, Diaptomus gatenensis.

Feeding habits of two abundant zooplankters, Ceriodaphnia cornuta and Diaptomus gatenensis, were experimentally investigated in an effort to relate their grazing to the 85% predominance of small green and blue-green phytoplankton cells in Gatun Lake in the Panama Canal Zone. The grazing decreased the nannoplankton species Cyclotella stelligera, Oocystis lacustris, Scenedesmus bifuga, Chroomonas, two chlorophytes, one flagellate, Synechocystis, and Dactylococcopsis irregularis. Ankistrodemus, one chlorophyta and two flagellates increased; Chrooccaceae cyanophyte and two other Cyanophytes did not change numerically. The unchanged species were spherical, probably all blue-greens with gelatinous matrices, and commonly 1-2 microns in diameter. They constituted an average of more than 75% of the total nannoplankton cells. Since these forms are well within the filtration range of these passively size-selective grazers, the presumption is that these dominant algal forms were ingested by the zooplankton but since their numbers were not reduced in the grazing experiments, they apparently were not eaten. The observations suggest that although in this lake any filter-feeding zooplankter will ingest a large number of algae particles, most have no nutritive value this explaining why the nannoplankton can maintain such numerical density. This may be the reason why the normal diurnal zooplankton densities rarely exceeded 10/l. (Auen-Wisconsin)
W77-07507

ROLE OF OLIGOCHAETES IN THE CIRCULATION OF WATER AND SOLUTES ACROSS THE MUD-WATER INTERFACE,
L. W. Wood.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1530-1533, 1975. 1 fig., 5 ref.

Descriptors: *Oligochaetes, *Mud-water interfaces, *Translocation, *Tracers, Rhodamine, New York, Water circulation, Path of pollutants.
Identifiers: *Canadarago Lake(NY).

The extent of movement water and dissolved materials from the water column into sediment by pumping action of oligochaetes was investigated in Lake Canadarago (New York), using rhodamine B as the tracer. The method relies on the high sorptive capacity and possible microbial degradation of the dye. A control experiment measured physical and microbial elimination of the dye and its results were used to determine the movement of water by the macroinvertebrates alone. While burrows exist to depths of 30-35 cm below the mud-water interface, work with tritiated water indicated that in reconstituted systems of 6 cm maximum depth, most of the circulation is limited to the upper 4 cm. This suggests that most of the pumping exchange by the oligochaetes may be related to respiratory rather than feeding movements. The results showed a considerable influx of water to the sediments, which must equal the volume of water containing solutes flushed from the sediments. In eutrophic Canadarago Lake the potential export of water from the sediments due to sludgeworm activity amounted to 51 to 107 ml/sq m/hr, thus they are not only ecologically important but are a factor in the transport of pollutants from the sediments to the water column. (Auen-Wisconsin)
W77-07508

STRATEGIES FOR EXISTENCE OF ZOOPLANKTON PREY IN HOMOGENEOUS ENVIRONMENTS,
T. M. Zaret.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1484-1489, 1975. 1 tab., 26 ref.

Descriptors: *Selectivity, *Lakes, *Predation, *Zooplankton, Behavior, Resistance, Movement, Vertical migration.
Identifiers: *Pelagic waters, *Prey behavior, Prey selection.

Predator avoidance behavior by zooplankton is discussed, especially in pelagic lake waters, as it relates to the selective factor of the prey population and community structure. Different types of selective pressures from visual predators (primarily vertebrates) and grasping predators (invertebrates) exploit. In those instances where the prey coexists with its predator, its avoidance mechanism is by vertical migration, i.e., the potential prey species remain in deep waters during the day and appear in the surface waters only when reduced light deters the light-dependent planktivores' feeding. This behavior is exemplified by the calanoid copepod Diaptomus gatunensis and by Daphnia. To avoid non-visual grasping predators, prey that are too large to be captured or handled effectively can escape. It has been shown that planktivorous fishes do not actually select individual prey according to body-size, but rather by total visible pigmentation, concentrated mainly in the large compound eye with the body-size usually a direct correlate. This type of predation pressure can lead to changes in composition within a single species, so that a second morph, having a reduced total pigmentation, may appear in the population when fish predation is heavy. Other predation avoidance strategies employed by rotifers and crustaceans are by direct swimming or reduced motility. (Auen-Wisconsin)
W77-07509

SIMILARITIES AND DIFFERENCES IN THE CHEMICAL COMPOSITION OF WATERS FROM WEST, CENTRAL, AND EAST AFRICA,
For primary bibliographic entry see Field 5A.
W77-07510

SYMAP COMPUTER PROJECTIONS OF SUMMER ZOOPLANKTON POPULATIONS IN VAN LAKE, MONTANA,
For primary bibliographic entry see Field 7C.
W77-07511

BACTERIOLOGICAL STUDIES IN THE CIENAGA GRANDE (GREAT MARSH) OF SANTA MARIA, COLUMBIA, (IN SPANISH),
R. Jeske.
Mitt Inst Colombo-Aleman Invest Cient 'Punta De Betin' 8, p 17-32, 1976.

Descriptors: *Bacteriology, Bacteria, South America, E. coli, *Aquatic bacteria, *Salmonella, Salinity, Marshes, Water pollution, *Salt marshes, Water pollution.
Identifiers: Crassostrea-Rhizophorae, *Columbia(Cienaga Grande), Santa Maria(Columbia).

Among the aquatic bacteria of the Cienaga Grande halophilic forms predominate in the salinity range of brackish water. Their number further rises while the salinity decreases during the rainy season. Only at salinities below 10‰, however, the fresh water bacteria increase. They reach a temporary maximum at about 3‰ salinity. At the same time the halophilic flora decreases. Using the intestinal bacterium Escherichia coli as an indicator, a certain degree of pollution can be detected near the fishing villages, and rarely in the rest of the lagoon. Oysters, Crassostrea rhizoforae (100), were examined for Salmonella and gave negative results. Of 6 water samples collected between the lake dwellings of Bocas de Aracataca, 4 contained Salmonella. The present degree of pollution of the Cienaga Grande is not alarming with respect to the oyster fishery.--Copyright 1977, Biological Abstracts, Inc.
W77-07512

CALCULATION OF CALCIUM CARBONATE-CARBON DIOXIDE EQUILIBRIUM IN WATER AND MIXTURES OF WATER,
For primary bibliographic entry see Field 5A.
W77-07513

THE LENTIC AND LOTIC FRESHWATER TYPES OF MARION ISLAND (SUB-ANTARCTIC): A LIMNOLOGICAL STUDY,
J. U. Grobbelaar.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 949-951, 1975. 3 fig., 2 tab., 8 ref.

Descriptors: *Limnology, *Subarctic, *Antarctic, Lakes, Rivers, Chemical properties, Productivity, Morphology, Streams, Ponds, Lentic environment, Lotic environment.
Identifiers: *Marion Island(South Atlantic Ocean), Sub-antarctic.

Limnological characteristics of subantarctic Marion Island are described, including water chemistry, productivity, morphology, and the ecology of the small crater lakes, lava-lakelets, wallows, rivulets, creeks or streams. The volcanic island, situated at 46 35'S and 37 45'L, is exposed to a cold, wet and windy climate. The lentic bodies are shallow, with the littoral zone usually extending over the entire basin, and covered by a benthic algal felt lining. Their shallowness and prevailing strong winds preclude thermal stratification. Wind and wave action resuspend sediments, causing high turbidity. Humic acids leach from the surrounding peat deposits coloring the water light brown. The pH is 5.88 and mineral content varies between 15.2-1335.3 mg/l total ions. The bicarbonate content is low and the average alkalinity is 0.11 milliequivalents/l. Nitrogen and phosphorus were detectable only in biotically-fertilized waters. Major components of these waters are sodium, potassium, calcium, manganese, chlorine and sulfate; minor components are alkalinity, iron, nitrate-nitrogen, ammonia-nitrogen, and total dissolved phosphorus. The major ions duplicate those of sea water because the constant winds deposit seaspray and condense seawater in raindrops. Primary production in abiotic waters is among the lowest recorded in the world--0.01-0.05%. There are only two trophic levels: the first consists of phytoplankton and benthic algal felts; and the second, the herbivores represented only by zooplankton. Only the first trophic level may be present in wallows. (Auen-Wisconsin)
W77-07514

ALGAL RESPONSE TO NUTRIENT INPUTS IN SOME IOWA LAKES,
J. R. Jones, and R. W. Bachmann.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 904-910, 1975. 2 fig., 3 tab., 18 ref.

Descriptors: *Estimating, *Algae, *Standing crops, *Phosphorus, *Iowa, *Eutrophication, Agricultural runoff, Rainfall, Analytical techniques, Lakes.
Identifiers: *Nutrient budgets, Lake West Okoboji(Iowa), Lake East Okoboji(Iowa), Big Spirit Lake(Iowa), Gar Lake(Iowa).

If algal populations are controlled by annual phosphorus inputs and if plankton algae are able to use all the phosphorus made available, then maximum algal crop should be related the the potential phosphorus concentration; consequently this maximum would represent the largest standing crop attained from a given phosphoru load. This assumption was investigated by determining annual phosphorus inputs from agricultural runoff and rainfall to four Iowa lakes(West Okoboji, East Okoboji, Big Spirit, and Gar). On the average, 0.35 kg/ha of total phosphorus annually was lost from the watersheds during the three-year study. Rainfall contributed approximately 0.032 gm/sq m of phosphorus annually. Potential phosphorus concentrations differ among lakes and are inversely proportional to their hydrologic turnover times. The mean July-August chlorophyll-a value, representing the peak bloom, was used to represent maximum biomass and then regressed on the respective potential phosphorus concentrations. The lake with the highest potential phosphorus concentration had the greates chlorophyll concentrations, and lakes with proportionally smaller phosphorus inputs had smaller algal crops; also, the algal populations were responsive to annual inputs. This approach provides a means of using nutrient budgets to estimate algal standing crops. The relationships between potential phosphorus concentrations and summer algal crops explains the differences among lakes as well as muchof the year-to-year differences within a single lake.(Auen-Wisconsin).
W77-07515

THE RELEASE OF DISSOLVED ORGANIC CARBON FROM SUBMERSED AQUATIC MACROPHYTES: DIEL, SEASONAL AND COMMUNITY RELATIONSHIPS,
R. A. Hough, and R. G. Wetzel.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 939-948, 1975. 9 fig., 4 tab., 15 ref. AEC AT-C11-1)-1599, C00-1599-82; NSF GB-15665, GB-81018X, GB-40311.

Descriptors: *Carbon cycle, *Aquatic plants, *Photosynthesis, *Respiration, *Michigan, Bulrushes, Kinetics, Lakes.
Identifiers: *Dissolved organic carbon, *Lawrence Lake(Mich), Najas flexilis, Scirpus subterminalis.

Release of dissolved organic carbon(DOC) as recent photosynthate has been demonstrated in aquatic vascular plants and has been estimated to comprise about 4% of total fixed carbon annually in a hardwater lake. This reduction of net photosynthesis is detrimental to plant production but the organic release may be beneficial to the community production. DOC release from Najas flexilis and Scirpus subterminalis in axenic cultures and in Lawrence Lake, Michigan, was measured simultaneously with release of carbon dioxide in a C14-assay for photorespiration. Najas released DOC somewhat more rapidly in darkness than in light, with a surge following sudden darkness. Organic release rates were largely independent of oxygen and carbon dioxide concentration. Release kinetics suggested that glycolate was not extensively excreted by Najas but rather was oxidized in photorespiration. Organic carbon release from Najas cultures was greater in presence of epiphytic diatoms whereas release in presence of organic carbon in situ was relatively low in Najas in summer but increased 4-fold in the fall during senescence. Release rates in early afternoon were over 2-fold those in the morning and late afternoon. Release of organic carbon by Scirpus was lowest in fall and highest in the spring. (Auen-Wisconsin).
W77-07516

THE ROLE OF PHOSPHATE IN EUTROPHICATION. STIMULATION OF PLANKTON GROWTH AND RESIDENCE TIMES OF INORGANIC PHOSPHATE IN LAKE KINNERET WATER,
M. Halmann, and A. Elgavish.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1351-1356, 1975. 3 fig., 1 tab., 13 ref.

Descriptors: *Eutrophication, *Phosphates, *Nitrates, *Biomass, Algae, Growth rates, Limiting factors, Turnovers, Asia, Lakes.
Identifiers: *Lake Kinneret(Israel).

The effects of added nutrients on the plankton biomass and the influence of environmental factors on the residence time of dissolved phosphate in Lake Kinneret, Israel, were investigated. Bottle

tests were made on the growth stimulatory effect of added nitrate, ammonium, phosphate, nitrate + phosphate, iron and silicate ions, and vitamin B12 on the total biomass. Turbidity, dry weight and chlorophyll content were used as biomass measurements. Addition of phosphate significantly increased both the growth rate and the biomass production, while addition of phosphate + nitrate caused an even larger increase in biomass. Growth stimulation induced by added phosphate was most noticeable during winter and spring, and was less pronounced during late summer. The other added nutrients did not affect growth. The residence times of dissolved phosphate were measured, using P32-orthophosphate as a tracer. Residence times varied between winter and summer(water temperatures 14.5-30C)from several hours to about 13 minutes. Turnover of phosphorus was inhibited to various extents by additions of 3-(3,4-dichlorophenyl)-1, 1-dimethy urea, m-chlorocarbonylcyanide phenylhydrazone, and arsenate but was completely blocked by the addition of formalin. (Auen-Wisconsin).
W77-07517

THE INFLUENCE OF SPRING CIRCULATION ON ZOOPLANKTON DYNAMICS IN THE PLUSSEE,
W. Hofmann.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1241-1250, 1975. 11 fig., 8 ref.

Descriptors: *Zooplankton, *Spring, *Mixing, *Stratification, Niches, Distribution, Foreign countries, Seasonal, Lakes.
Identifiers: *Lake Plussee(Germany).

The effect of incomplete spring circulation on the zooplankton community and individual populations were investigated in Lake Plussee, Germany. It had been noted that many zooplankton populations exhibited an exponential growth rate after the ice break-up, generally with large changes in abundance and distribution within a short period. In 1970 the ice break-up occurred on April 20th, mixing only the upper 10M of the water column; conversely, in 1972 the ice break-up occurred on March 20th and before stratification began there was a total mixing of the water column. While the ice break-up occurred one month later in 1970 than in 1972, the maximum zooplankton abundance was as high as in 1972 due to the very rapid growth of rotifers. In contrast to the increase, abundance decreased at nearly the same time in both years. Both cladocerans and copepods were much more abundant in 1970 than they were in 1972. The 1972 conditions were advantageous for Keratella guadrata, Kellicottia longispina, Asplanchna priodonta, Bosmina longirostris, Eudiaptomus gracilis and Mesocyclops luecharti, whereas in 1970 Asplanchna girodi and Synchaeto pectinata were more abundant. The niche overlap was high in 1970 due to crowding of all populations in the 10 m of the water column, and contained a low diversity index. (Auen-Wisconsin).
W77-07518

RESPONSE TO EUTROPHIC SHAGAWA LAKE, MINNESOTA, U.S.A., TO POINT-SOURCE, PHOSPHORUS REDUCTION,
D. P. Larsen, K. W. Malueg, D. W. Schults, and R. M. Brice.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 884-892, 1975. 6 fig., 1 tab., 14 ref.

Descriptors: *Nutrient removal, *Phosphorus, *Lakes, *Tertiary treatment, Sewage effluents, Cycling nutrients, *Minnesota.
Identifiers: *Lake restoration, *Shagawa Lake(Minn.), Point-source pollution.

Changes brought about by the construction of a tertiary sewage treatment plant at Ely, Minnesota, and a subsequent 70% reduction of phosphorus loading to nearby eutrophic Shagawa Lake, are discussed. The average annual load of wastewater phosphorus to the lake from 1967 to mid-1974 was 5380 kg. Waste phosphorus loas was reduced to about 25% during 1973, when the treatment plant first went into operation. During 1973 and 1974 the lake had entered a phosphorus washout phase, approximately 50% more phosphorus leaving the lake than entering. However, Shagawa Lake appears to have reached a state of internal loading, especially during July and August, that contributes a sufficient amount of phosphorus to produce large algae crops. Mass balance estimates demonstrated that the internal phosphorus load during July-August 1971-1973 was sufficient to increase the average phosphorus concentration in the lake 1-2 microgram/1/day. Most of this internal load was redeposited during the fall overturn and thus had little influence on the annual calculations of the phosphorus budget. During 1973,the internal phosphorus load increased from 30 microgram/1 to more than 80 microgram/1, thus the projected improvement of the lake in two years was unattainable.(Auen-Wisconsin).
W77-07519

MEROMIXIS IN ULMENER MAAR (GERMANY).
K. M. Stewart, and E. Hollan.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1211-1219, 1975. 5 fig., 1 tab., 17 ref.

Descriptors: *Thermal stratification, *Lakes, Profiles, Foreign countries, Limnology, Water temperature.
Identifiers: *Meromixis, *Ulmener Maar(Germany).

Extensive changes noted in the temperature profiles of the Ulmener Maar, Germany, lead to investigations of whether this classic example of a spring-fed meromictic lake was undergoing changes in its stratification. Because of increased water usage from Ulmener Maar, the Jungfernweiher Reservoir was constructed on the north side of the lake between 1940-1945 by damming a small brook, which did not affect the lake. Water from the reservoir was directed through a tunnel to the lake to augment it's water supply. The intensive water use from the lake caused the water level to fluctuate more than 7 m over the years. The water was normally taken from drilled wells on the bank of the lake to provide 'bank filtered' water. About 1957, two wells were extended from approximately 5 m to 20 m below the mean water level to increase the water supply. Comparisons of oxygen and density values with historical records indicated that the water withdrawal, the water level fluctuations, and the inflow from the reservoir have apparently changed the strong meromictic condition of Ulmener Maar to one which is only marginally or irregularly meromicic, or to one with a very thin monimolimnion. (Auen-Wisconsin)
W77-07520

SOURCES OF NITROGEN AS A WATER POLLUTANT: INDUSTRIAL WASTE WATER,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5B.
W77-07521

OIL-OXIDIZING BACTERIA OF THE RIVER YENISEI, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Microbiology.
T. V. Koronelli, and V. E. Golimbet.
Biol Nauki (Mosc) 19(1), p 105-108, 1976.

Descriptors: *Aerobic bacteria, Isolation, *Lipids, Water pollution, Pollutant identification.
Identifiers: *Arthrobacter-Sp, Mycobacterium-Ceroformans, Mycobacterium-Paraffinicum, *Mycobacterium-Sp, Russian-SFSR, *River Yenisei(USSR), *Oil-oxidizing bacteria.

Different strains of Mycobacterium and Arthrobacter were isolated from the water of the Yenisei (Russian SFSR, USSR) and divided into 4 groups according to their cultural properties in hard medium with paraffin. The Mycobacterium and Arthrobacter strains differed in the qualitative composition of free lipids. The lipids of Mycobacterium sp. E-27 were similar to Mycobacterium paraffinicum, and the lipids of Arthrobacter sp. E-8 to Mycobacterium ceroformans.--Copyright 1977, Biological Abstracts, Inc.
W77-07532

MATHEMATICAL MODELS OF STRONTIUM-90 BEHAVIOR IN 'WATER-FRESH WATER FISH SPAWN' SYSTEM FOR PARTICULAR CASES OF RADIOACTIVE CONTAMINATION OF RESERVOIRS, (IN RUSSIAN),
Institute of Radiation Health, Leningrad (USSR).
S. Y. Sukal'skaya, I. A. Likhtarev, N. I. Mashneva, and A. A. Moiseec.
Zh Obshch Biol 37(3), p 459-470, 1976.

Descriptors: *Mathematical models, *Stronium radioisotopes, *Radioactivity, Reservoirs, Water pollution, *Spawning, Fish behavior.
Identifiers: *Strontium-90.

A 2-compartment model for 90Sr exchange in the water-fresh water fish spawn system is proposed. Systems of differential equations were examined which describe kinetics of 90Sr accumulation in and elimination from the fish spawn in some likely situations of aquatic radioactive contamination. Theoretical calculation results were compared to those of experimental studies of the time course of 89Sr accumulation and retention. The proposed model can be used for data interpretation and for designing further experiments.--Copyright 1977, Biological Abstracts, Inc.
W77-07539

DYNAMICS OF GAS BUBBLE FORMATION IN SALMONIDS,
Washington Univ., Seattle. Coll. of Fisheries.
L. S. Smith, D. L. Beyer, and B. G. D'Aoust.
Research in Fisheries, 1974, p 12-13. 2 fig.

Descriptors: *Fish diseases, *Fish physiology, *Animal pathology, *Laboratory tests, Methodology, Test animals, *Supersaturation, *Hydrostatic pressure, Argon, Helium, Neon, Bioassays, Coho salmon, Mortalities, *Salmonids.
Identifiers: *Gas bubble disease, Human medicine, Gas embolism.

Studies using fish with dissolved atmospheric gases can be utilized to test certain responses of fish that can be directly applicable to human diving physiology. Critical fish tissues were saturated with gas within 60 to 90 minutes. Fish tissues saturated to 115% are equilibrated to this gas level long before bubbles start to form. (Katz)
W77-07559

A BACTERIOLOGICAL INVESTIGATION OF MEAT PACKING PLANT EFFLUENTS IN THE PROVINCE OF ALBERTA WITH PARTICULAR EMPHASIS ON SALMONELLA,
Environmental Protection Service, Edmonton (Alberta). Northwest Region.
For primary bibliographic entry see Field 5D.
W77-07560

SALMONELLA IN POULTRY PACKING PLANT EFFLUENTS,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5D.
W77-07561

THE DISTRIBUTION OF RESIDUAL QUANTITIES OF DDT IN THE ORGANS AND TISSUES

OF FISH OF THE KIEV RESERVOIR, (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5B.
W77-07572

STUDIES ON THE TYPOLOGY OF BALTIC LAKES WITH DIFFERENT STATES OF EUTROPHICATION, (IN GERMAN),
For primary bibliographic entry see Field 5B.
W77-07576

LAKE RESTORATION BY BOTTOM WATER SIPHONING, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland).
For primary bibliographic entry see Field 5G.
W77-07577

MODELS FOR SIMULATION OF EUTROPHICATION OF LAKES FOR LAKE CONSTANCE (BODENSEE-OBERSEE): I. DATA FROM LAKE CONSTANCE USED IN SIMULATION MODELS, (IN GERMAN),
Baden-Wuerttemberg Landesanstalt Fuer Unweltschutz (West Germany). Inst. of Seenforschungs Fischereiwesen.
G. Wagner, and H. Wohland.
Arch Hydrobiol 77 (4), p 431-457, 1976.

Descriptors: *Eutrophication, Lakes, *Simulation analysis, *Model studies, Algae, Fertilizer, Water pollution, Data collections, *Phosphorus, Oxygen, *Phosphates.
Identifiers: *Lake Constance(Switzerland), Oxygen balance.

Simulation modeling data describing the water layers, the input and accumulation of P compounds, the quantity of algae and the balance of 02 in Lake Constance are presented. The data correlate with the time-dependent growth of the human population and to the sales of poly-phosphate and P fertilizers. --Copyright 1976, Biological Abstracts, Inc.
W77-07579

MACROPHYTES AND PHOSPHORUS IN LAKE ANDSJON, CENTRAL SWEDEN, (IN SWEDISH),
L. Thofelt, and L. Olden.
Fauna Flora (Stockh) 71(1), p 29-34, 1976.

Descriptors: *Phosphorus, Lakes, Farm wastes, Birds, Aerial photography, Vegetation, Biomass, Water pollution control, Algal control, Aquatic weed control.
Identifiers: Bird sanctuary, *Carex-Rostrata, *Macrophytes, *Phragmites-Communis, Reeds, *Lake Andsjon(Sweden).

Lake Andsjon, a bird sanctuary and nature preserve in central Sweden, is a shallow lake surrounded by agricultural land and housing developments. Due to manuring of the fields the phosphorus content of the lake frequently exceeds 20 micrograms P/dm-3 and the lake is becoming overgrown with reeds, primarily Phragmites communis and Carex rostrata. Ten sample plots were taken in the northern part of the lake and all vegetation was removed for biomass determinations. The areal extent of the vegetation was determined by means of aerial photos and through the ice in late winter. Of the 34.2 ha surface of the lake 37.1% was covered with Phragmites and 4.4% with Carex. The dry weight of vegetation per m2 of sample plot was 5000 g for Carex. Phragmites ranged from 600 g for thin stands up to 4100 g for dense stands. The P content per gram of dry matter was 1.7 mg in Carex roots and 1.2 mg in tops with comparable values for Phragmites of 1.1 and 0.68 for thin stands and 0.67 and 0.54 for dense stands. By removing the vegetation the P content would be decreased by 80% and new vegetation would be able to absorb most of the P entering the lake in the future.--Copyright 1977, Biological Abstracts, Inc.
W77-07582

STUDIES ON FUNGAL PROPAGULES IN THE WESER ESTUARY (GERMAN BIGHT): I. QUANTITATIVE DATA 1974, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
K. Schaumann.
Veroeff Inst Meeresforsch Bremerhaven 16(1), p 63-82, 1976.

Descriptors: *Bacteria, *Estuaries, Data collections, *Aquatic fungi, Seasonal, Nitrogen, Oxygen, Yeasts, Water temperature, Biochemical oxygen demand, Turbidity.
Identifiers: *Fungal propagules, *Mycelia-forming fungi, *Weser Estuary(Germany), German Bight.

As part of the Weser Estuary Research Program, initiated for the control of hydrographic and biological conditions in this habitat; the number of higher fungal propagules in the waters of the Weser estuary at Bremerhaven was determined monthly during a 1 yr period from Jan.-Dec. 1974, using the pour-plate method. Mycelia-forming fungi (Hyphomycetes) and yeast-like fungi occurred in numbers up to 145,800 and 135,600, respectively, and revealed striking seasonal variations, with high numbers in winter and much lower number in summer. This pattern was evident in the surface waters as well as in the near-bottom waters. During winter the fungal numbers in the latter was nearly twice as high as the surface. Similar fluctuations were exhibited by several hydrographic factors, e.g., turbidity, organic N, biological O2 demand, freshwater inflow, water temperature and number of heterotrophic bacteria. Whether the correlation between these factors and fungi is causal or parallel cannot be decided. The origin and activity of the fungal propagules in the ecosystem of the Weser estuary are discussed.--Copyright 1977, Biological Abstracts, Inc.
W77-07583

DATA 1973/1974 REGARDING HYDROGRAPHY AND WATER QUALITY IN THE WESER ESTUARY, GERMANY, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
S. Wellershaus.
Veroeff Inst Meeresforsch Bremerhaven 16(1), p 45-62, 1976.

Descriptors: *Bacteria, *E coli, Water quality, *Estuaries, Data collections, Salinity, Water temperature, Dissolved oxygen, Nitrogen, *Aquatic fungi, Water pollution.
Identifiers: *Weser Estuary(Germany).

At 6 positions between Esenshamm and Robbenplate monthly measurements were done of salinity, temperature, dissolved O2, 5-day biochemical O2 demand (BOD5), Kjeldahl-N, turbidity (light-attenuation), settling volume and pH. At 1 station, counts of bacteria including Escherichia coli, of higher fungi and of chytrid fungi were added. According to the water quality evaluation suggested by Liebmann (1969) and Hamm (1969) the Weser Estuary can be classified into class II-III, III, and III-IV, sometimes locally reaching class IV. Water quality is poorest within the turbidity cloud which develops near Bremerhaven and Nordenham, and a few Kilometers seaward of Bremen.--Copyright 1977, Biological Abstracts, Inc.
W77-07584

OUTBREAK OF CHIRONOMID MIDGE IN A POLLUTED RIVER AND THE CHEMICAL CONTROL OF THE LARVAE, (IN JAPANESE),
Kagoshima Univ. (Japan). Dept. of Medical Zoology.
For primary bibliographic entry see Field 5G.
W77-07585

STUDY OF BACTERIAL CONTAMINATION IN THE PORT MAHON HARBOR: EFFECT OF ECOLOGICAL CONDITIONS OF THE HARBOR, (IN SPANISH),
Instituto Espanol de Oceanografia, Palma de Mallorca (Spain). Coastal Lab.
For primary bibliographic entry see Field 5A.
W77-07588

HYGIENIC STANDARDIZATION OF DISODIUM SALTS OF META-AND PARA-DIISOPROPYLBENZENE IN WATER BODIES, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR). Div. of Public Hygiene.
A. G. Ilichkina.
Gig Sanit 5, p 19-21, 1976.

Descriptors: Salts, Public health, Organic compounds, *Organoleptic properties, *Self purification, *Toxicity, *Lethal limit, Water quality standards, Water pollution.
Identifiers: *Benzene.

The effects of the disodium saltof digydroperoxide of m-diisopropylbenzene (Na-M) and that of p-duspropylbenzene (Na-P) on the organoleptic properties and self-purification processes of water were studied Toxicity stuties on greases and oils are used for extraction and concentration of surfactants from waters and wastes. The rdies were done with single and chronic oral administration to mice, rats and rabbits. The maximum permissible cecovery rate is 97 1% with vaseline oil in the conditions exposed. On this oil, surfactants may form colored complexes with ligands allowing direct colorimetric determinations. Different techniques are developed. --Copyrigoncentration of Na-P is 1 mg/1 and that of Na-M is 0.5 mg/1. The limiting index is toxicologic. --Copyright (c)ht (c) 1977, Biological Abstracts, Inc.
W77-07590

SELF-PURIFICATION IN THE COASTAL WATERS OF THE BLACK SEA, (IN RUSSIAN),
O. G. Mironov, L. N. Kiryukhina, M. I. Kucherenko, and E. P. Tarkhova.
Naukova dumka: Kiev, USSR, (1975), 143 p.

Descriptors: *Self purification, Bottom sediments, Water purification, *Oil pollution, *Bacteria, Marine life, Pseudomonas.
Identifiers: Bacillus, Chromobacterium, Microbacterium, Micrococcus, Mycobacterium, Pseudobacterium, USSR, Vibrio, *Petroleum oxidizing bacteria, *Black Sea.

The self-purification of the waters and bottom sediments of the coastal zone of the Soviet shores of the Black Sea (USSR) from petroleum is discussed. Data on the numbers, species composition, distribution and biochemical characteristics of petroleum-oxidizing bacteria are presented, and the physicochemical properties and processes of the transformation of organic substances from the marine bottom sediments are analyzed. Petroleum-oxidizing bacteria of the genera Pseudomonas, Pseudobacterium, Chrombacterium, Micrococcus, Microbacterium, Mycobacterium, Bacterium, Bacillus and Vibrio were isolated in the studied area. The capacity of this marine area for self-purification is evaluated. The monograph is intended for oceanographers, hydrobiologists, ichthyologists and those employed in fisheries, the marine fleet, hydrometeorological service and environmental protection.--Copyright 1977, Biological Abstracts, Inc.
W77-07592

FIRST INFORMATION ABOUT N, P NUTRIENTS AND THE PRODUCTION OF LAKE TRASIMENO, (IN ITALIAN),
Perugia Univ. (Italy). Istituto di Idrobiologia e Pescicultura.
M. V. DiGiovanni, F. S. Gianotti, L. Mantilacci, and O. Tiberi.
Riv Idrobiol 13(2/3), p 281-360, 1974.

Descriptors: *Nitrogen, *Phosphorus, Lakes, *Phytoplankton, *Nutrients, Air temperature, Water temperature, Seston, *Zooplankton, Water pollution.
Identifiers: Lake Trasimeno(Italy).

This research was carried out from May 1973-May 1974 in 3 stations of Lake Trasimeno: the central zone of the lake (pelagic zone), Monte del Lago (neritic zone) and La Frusta (neritic SE zone). Air and water temperature, depth, transparency, suspended matter, seston, nitrogen (total N on the filter, total N in the water: ammonia-N, N02-N, N03-N p (total p on the filter, total p in the water), phytoplankton and zooplankton were examined. Copyright 1977, Biological Abstract,. Inc.
W77-07593

PHYTOMICROBENTHOS OF THE KURTLI RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki.
K. Sadykov.
Izv Akad Nauk Turkm SSR Ser Biol Nauk 2, p. 50-55, 1976.

Descriptors: *Algae, *Benthos, *Cyanophyta, Diatoms, Reservoirs, Water pollution.
Identifiers: *Protococcal algae, *Kurtli Reservoir(USSR).

Plants (230) were recorded in the benthos of the Kurtli Reservoir (USSR). Included are diatoms, blue-green algae and some protococcal algae. The algae are characterized by a rich qualitative composition and intensive development during the summer-autumn period, in benthic silty sands in particular.--Copyright 1977, Biological Abstracts, Inc.
W77-07596

EFFECT OF ORGANIC ACIDS ON EXPERIMENTAL MANGANESE ISOLATION FROM BOTTOM SEDIMENTS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5B.
W77-07597

CUMULATION, DESORPTION AND MECHANISM OF ACTION OF ORGANOCHLORINE TOXIC CHEMICALS ON CESTODES OF FISHES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
O. N. Davydov, I. I. Perevozchenko, L. P. Braginskii, and G. Bal'on.
Parazitologiya (Leningr) 10(3), p. 238-244, 1976.

Descriptors: *DDT, *Pesticide residues, Carp, Toxicity, *DDD, *DDE, Pikes, *Fish parasites, Water pollution effects, Distribution, Chemical wastes, Chlorine.
Identifiers: *Amylolysis activity, Bothriocephalus-gowkongensis, *Cestodes, Desorption, Glycogen, Triaenophorus-nodulosus, *Organochlorine chemicals.

The distribution of residues of DDT and its metabolites (DDD and DDE) in tissues of Triaenophorus nodulosus and its host (pike) was studied. Cestodes can accumulate large amounts of organochlorine substances. The ability of Bothriocephalus gowkongensis (cestode of carp) to dechlorinate p, p-DDT and to excrete p,p-; o,p- and m,p-DDD from the organism was established. p,p-DDT decreased the glycogen content and caused increased amylolytic activity in the cestodes in acute tests. The effect of p,p-DDT on locomotor activity in the cestodes has 2 phases, the first associated with the muscular influence and the second with a neurotrophic effect. m,p-DDD (0.1 mg/1) was highly toxic to the locomotor activity of cestodes, as compared with the effect of p,p-and o,p-DDD.--Copyright 1977, Biological Abstracts, Inc.
W77-07598

STUDY OF BACTERIA ASSOCIATED WITH THE REARING OF LARVAE OF MARINE BIVALVES, (IN FRENCH),
Universite de Bretagne-Occidentale, Brest (France). Laboratoire de Zoologie.
D. Prieur.
Aquaculture 8(3), p. 225-240, 1976.

Descriptors: *Bacteria, *Algae, Larvae, *Nutrient requirements, Marine animals, Water pollution.
Identifiers: Antibiotics, *Bivalves(Marine), Mytilus-edulis.

Bacterial strains (81) associated with the rearing of marine bivalve larvae were isolated from different origins: unicellular algal cultures, filtered sea water, unhealthy larvae, Mytilus edulis spawn, and contaminating strains from the laboratory atmosphere. The ecological, bio-chemical and nutritional characteristics and the sensitivity to antibiotics of these strains were studied with the aid of 115 tests. This population appears to be similar to comparable populations studied by others. Complementary studies taking into account the quantitative and qualitative variations of each source of bacterial contamination are necessary and are now in progress. When these are complete, more efficient bacterial control of the breeding of marine bivalve larvae will be possible.--Copyright 1977, Biological Abstracts, Inc.
W77-07599

5D. Waste Treatment Processes

INTERACTIONS OF CUPRIC ION WITH HUMIC ACID,
Missouri Univ. Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-07104

USE OF CATION POLYELECTROLYTES FOR WATER PURIFICATION FROM VIRUSES, (IN RUSSIAN),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
For primary bibliographic entry see Field 5F.
W77-07108

NITRATE IN GROUND WATER AND ITS RELATION TO FERTILIZATION, (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 5B.
W77-07112

THE DEVELOPMENT OF REGIONAL INDUSTRIAL WASTE PROCESSING CENTRES,
Re-Chem International Ltd., Southhampton (England).
A. K. Coleman.
Water Pollution Control, Vol. 76, No. 1, p 67-74, 1977. 1 fig.

Descriptors: *Chemical wastes, *Treatment facilities, Industrial wastes, Pollution abatement, Chemical treatment, Waste disposal, Inorganic compounds, Organic matter, Filtration, Incineration, Laboratory tests, Sludge treatment, Waste water treatment, Dewatering, Design criteria, Legislation.

Legislation and increasing public concern have created a need for regional industrial waste treatment facilities in England. Alternatives to land disposal and discharge to receiving streams, such as chemical treatment, incineration, polymerization, recovery, and recycling are receiving much investigation. Design criteria for these regional centers should consider all possible safeguards against any type of environmental pollution that might result from the disposal scheme chosen. The Re-Chem International Regional Waste Treatment Center was discussed in detail. A major feature of this facility is strict laboratory control at all stages of each process. Inorganic wastes are treated by wet chemical processes to convert them into water soluble or insoluble derivatives which can be removed from the water. Recovery products are later dispatched to a purchaser. Non-recoverable materials are subjected to effluent filtration, gravity sludge thickening, dewatering by pressure filtration, and land disposal, pending laboratory analysis. Water produced by the process is analyzed for toxicity and treated by a 'polishing' chemical process for decontamination. Solids are passed to the filter cake disposal bins. Final effluent is subject to laboratory certification. Organic wastes are incinerated by a process having various automatic controls and safeguards to ensure proper operation. Odor from the treatment processes are controlled by air extraction systems and high incineration temperatures. The process is most applicable to wastes from the chemical industry. (Collins-FIRL)
W77-07205

PHENOL-SELECTIVE, HIGHLY RESISTANT RO-MEMBRANES MADE FROM PVA FOR THE PURIFICATION OF TOXIC INDUSTRIAL WASTES,
Erlangen-Nuremberg Univ. (West Germany). Institut fuer Technische Chemisches.
S. Peter, N. Hese, and R. Stefan.
Desalination, Vol. 19, p 161-167, 1976. 7 fig, 1 tab, 11 ref.

Descriptors: *Phenols, *Reverse osmosis, *Chemical wastes, *Membrane processes, Ion exchange, Separation techniques, Water purification, Chemical industry, Industrial wastes, *Waste water treatment.
Identifiers: *Polyvinylalcohol membranes.

Phenols have been amongst the most difficult chemical wastes to remove in water purification processes. Experiments using membranes of polyvinylalcohol (PVA) were conducted to determine their usefulness in removing phenols by reverse osmosis. Two types of membranes were used. One of them was formed by complexing PVA in an aqueous or organic solution with boric acid, precipitating by acetone and air-drying, solving in a solvent or solvent mixture, and drawing to size on a steel plate. The other was made by drawing a film of defined thickness on steel plates from a concentrated solution of PVA in water. This was also precipitated in acetone; both were crosslinked by immersion in a polyvalent metal ion solution. The membranes are insoluble in water, acids, bases, and the usual organic solvents. They are resistant to phenol up to 5 weight % and show a pronounced phenol selectivity. Retentions up to 90-95% were produced. (Collins-FIRL)
W77-07206

LARGE-SCALE REVERSE OSMOSIS PROCESSING OF METAL FINISHING RINSE WATERS,
Universal Oil Products Co., San Diego, Calif. Fluid Systems Div.
S. S. Kremen, C. Hayes, and M. Dubos.
Desalination, Vol. 20, p 71-80, 1977. 1 fig, 2 tab.

Descriptors: *Water reuse, *Reverse osmosis, *Heavy metals, Industrial wastes, Copper, Zinc, Salts, Chromium, Acids, Flocculation, Filtration, Polyelectrolytes, Filters, Waste treatment, Performance, Design, *Waste water treatment.

Identifiers: *Metal finishing wastes.

Desalination is only one tool for augmenting potable water supplies. Another way to achieve this goal is to increase reusable water sources by purification. A reverse osmosis process and system were developed to purify a dilute waste stream from a metal finishing plant. The wastes contain copper, zinc, salts, acid, and chromium compounds. The chromium present in the waste water was precipitated for use a a flocculating aid by increasing the pH of the solution to 5.5; additional polyelectrolyte flocculant was added prior to filtration. After this treatment, the filtrate from the granular media filters generally had a turbidity of less than 0.2 turbidity units. The solution was acidified to prevent precipitation of the remaining metal salts during reverse osmosis. The waste was first concentrated by a factor of about 5, then the pH was raised again for further concentration to a 95% water recovery. Finally, the solution was acidified, chromate was reduced with sulfur dioxide, and caustic soda was added to precipitate the hydrous oxides of copper, zinc, and trivalent chromium. The resulting sludge, about 400 gallons per day, was landfilled. The plant performance, after shake-down, is in good agreement with design predictions. (Collins-FIRL)
W77-07207

CALCIUM CARBONATE IN THE REVOMAL OF IRON AND LEAD FROM DILUTE WASTE WATER,
Western Regional Research Lab., Berkeley, Calif.
E. Hautala, J. Randall, A. Goodban, and A. Waiss, Jr.
Water Research, Vol. 11, No. 2, p 243-245, 1977. 3 fig, 1 tab, 7 ref.

Descriptors: *Iron, *Lead, *Calcium carbonate, *Metals, *Waste water treatment, Water purification, Industrial wastes, Water reuse, Water quality control, Chemical wastes.
Identifiers: *Chemical treatment.

A treatment was investigated for acidic waste water containing iron and lead resulting from the production of lead storage batteries. The presence of these metals prevents recycling of the water for production and prohibits disposal to sewer systems. Acid mine waters and steel pickle liquor resemble this effluent in acidity and sulfate and soluble iron content. They have been treated by calcium carbonate. This treatment was attempted with storage battery waste waters. Simple settling with CaC03 did not remove enough iron to meet the water quality standards required for reusing the water. Some form of filtration using CaC03 was recommended. Powdered CaC03 added to a slurry concentration of neutralized waste water, which was then filtered, produced an effluent with less than 0.2 ppm of iron and a lead concentration of less than 0.3 ppm. Lead concentrations depended upon proper pH control. Further filtration through a bed of redwood bark produced an effluent suitable for recycling or disposal to a sanitary sewer system. (Collins-FIRL)
W77-07208

TOXIC WASTE DISPOSAL,
Clyde River Purification Board, Glasgow (Scotland).
For primary bibliographic entry see Field 5G.
W77-07209

WASTE WATER RECLAMATION SYSTEM UPS PRODUCTIVITY, CUTS WATER USE,
Beckman Instruments, Inc., Porterville, Calif.
J. E. Warnke, K. G. Thomas, and S. C. Creason.
Chemical Engineering, Vol. 84, No. 7, p 75-77, March, 1977. 1 fig, 1 tab.

Descriptors: *Water consumption(Except consumptive use), *Reverse osmosis, *Evaporation, *Water reuse, *Water purification, *Heavy metals, Industrial water, Industrial wastes, Waste disposal, Water quality control, Sludge treatment, Filtration, *Waste water treatment.
Identifiers: Solar evaporation ponds.

A waste water reclamation system, featuring reverse osmosis and a solar evaporation pond for metal wastes disposal, was installed at a California electronics plant. Objectives of the program were to reduce water use, improve reclaimed water quality, and reduce waste discharges which interfered with production. Sensors were installed on the plating line to monitor the conductivity of reclaimed water in the rinse tanks and to make necessary corrections. This reduced comsumption from 1.5 million to 750,000 gallons/month. Plating shop waste water was split into two streams. One, consisting of previously reclaimed rinse water containing tin, lead, palladium salts, pumice, silicates, or methylene-chloride and contaminated city water, flowed to the solar evaporation pond. Reclamation was not attempted. The other stream was pretreated and processed by the reverse osmosis unit. Nearly 90% of the contaminated concentrate from reverse osmosis was returned to pretreatment for recycling. The remainder was sent to the pond. Pretreatment consisted of filtration, pH adjustment, and algae growth prevention. The reverse osmosis unit was capable of processing 25 gallons/minute of waste at a design efficiency of 90%. A granular carbon filter unit was used as a final polish for reverse osmosis permeate, even though about 90% of the heavy metals were removed by the membranes. The solar pond was designed to accommodate a waste discharge of 6,000 gallons/day. It was estimated that sludge removal would not be necessary for fifty years. When sludge is to be removed, it will be processed for metals recovery. Costs of the system were offset by water reduction, increased product quality, and the replacement of other treatment systems. (Collins-FIRL)
W77-07210

ELECTROLYTIC TREATMENT OF CHROMATE AND CYANIDE WASTES WITH PACKED BIPOLAR CELL, (IN JAPANESE),
Kyoto Univ. (Japan). Dept. of Industrial Chemistry.
S. Yoshizawa, Y. Miyazaki, and A. Katagiri.
Nippon Kagaku Kaishi, No. 1, p 19-24, 1977. 8 fig, 3 tab.

Descriptors: *Electrolysis, *Aqueous solutions, *Liquid wastes, Chemical reactions, Chemical properties, Physical properties, Oxidation, Waste treatment, *Waste water treatment, Evaluation, Activated carbon, Particle size.
Identifiers: *Cyanide wastes, Chromate wastes, Power efficiency, Reaction rates.

A packed bipolar cell was used for the electrolysis of liquid wastes containing cyanide and chromate. Characteristics of the system were evaluated by testing K2Cr04 and KCN solutions under various conditions of particle material, particle size, and applied voltage. Chromate ion was reduced to Cr(OH)3 that deposited on packed particles and cyanide ion was oxidized to CN0(-) or C02 and N2. When the cell was packed with activated carbon particles, power efficiency and the reaction rate were higher than in conventional cells. Increased applied voltage reduced power efficiency and increased the reaction rate. The solution concentration probably determined optimum particle size and applied voltage. (Collins-FIRL)
W77-07211

ULTRAFILTRATION OIL RECLAMATION PROCESS,
Chester Engineers, Inc., Coraopolis, Pa.
A. F. Lisanti, and R. Helwick.
Iron and Steel Engineer, Vol. 54, No. 3, p 60, March, 1977. 1 fig.

Descriptors: *Oil wastes, *Filtration, *Membrane processes, *Waste water treatment, Performance, Temperature, Sedimentation, Separation techniques, Industrial wastes, Heat treatment, Automatic controls, Water reuse.
Identifiers: *Ultrafiltration, Steel production.

An ultrafiltration process, using recovered oil as fuel and discharging separated water into a municipal sanitary sewer system was used to treat waste oil at three Pittsburgh, Pennsylvania, steel plants. No chemicals were added, no inorganic sludge was produced, and the effluent was free of floating oil. About 90% of the wastes was, by volume, and oil-in-water emulsion; 10% was tramp oil. The tramp oil was water insoluble and easily removed by quiescent settling and skimming. Water soluble oil emulsions were pumped through tubular membranes which retained oil droplets and suspended particles. Water and dissolved low molecular weight materials were passed through the membranes. The ultrafiltration membranes did not clog with contaminants. Backflushing removed any surface fouling. Productivity decreased as the feed concentration was increased. The temperature used should be the highest possible without creating short-term failure or long-term degradation. Normal operating temperatures were between 90 and 100 F. Safe operating pressures were found to be between 20 and 60 psig. The system also comprises a temperature indicator controller, pressure gauge switch assemblies, a flow meter, and an automatic purge system. Concentrated oily emulsions can be pumped to an available cooker where there is further oil and water separation. Sulfuric acid is added to facilitate this separation process and recovered oil is fed to a storage tank while the water is recycled to the ultrafiltration feed tank for retreatment. The system is reliable and flexible. (Collins-FIRL)
W77-07212

TECHNIQUES FOR PURIFYING OILY WASTE WATER,
Betz Labs., Inc., Trevose, Pa.
L. C. Hale, and D. Bauer.
Plant Engineering, p 131-133, March 17, 1977. 5 fig.

Descriptors: *Oil wastes, *Chemical treatment, *Polymers, Chemical degradation, *Waste water treatment, Water purification, Pollution abatement, Environmental control, Coagulation, Sedimentation, Flocculation, Industrial wastes.

Stricter environmental pollution regulations have forced industries to remove oily wastes from their effluents before discharging them into receiving streams or sewer systems. The removal of oil contaminants present many problems, but increased oil costs have given impetus to the search for suitable recovery methods. These alternatives were reviewed. Waste water from hot-strip-rolling mills, cold-rolling mills, and automotive and metal-forming plants is usually an oil-in-water emulsion. Polymers and emulsion breakers neutralize the repulsive charges between particles, precipitate or salt out emulsifying agents, or alter the interfacial film. Emulsion breakers for these wastes should be oil soluble and surface active. An acid and aluminum sulfate have been traditionally used; a newer method for coagulating and breaking emulsions is to use liquid cationic polymers. Separation by heat treatment can also be used for water-in-oil emulsions containing solids. Coagulation, flocculation, and sedimentation are used in combination to treat steel mill wastes. Refinery wastes are usually treated in gravity-type separators and then further treated in induced-air flotation units. Either batch or continuous processes can be used to remove oily contaminants. The former handles variations in waste composition better because the batches can be analyzed for specific final treatment. Continuous processes call for automatic controls to intensively monitor changes in waste composition. (Collins-FIRL)
W77-07213

INLINE SENSOR TIGHTENS CONTROL ON SLUDGE CONSISTENCY TO WITHIN 1.4-1.5% SOLIDS,
Crown Zellerbach Corp., Port Townsend, Wash.
H. Bolling, and K. Robe.
Chemical Processing, Vol. 40, No. 3, p 86-87, March, 1977.

Descriptors: *Filtration, *Automatic control, *Pulp wastes, *Sludge treatment, Solid wastes, Liquid wastes, *Waste water treatment, Equipment, Filters, Waste disposal, Efficiency, Performance, Pulp and paper industry.
Identifiers: Clarifiers, Kraft mill, Port Townsend(WA).

An inline viscosity sensor for the automatic control of clarifier underflow was developed to improve sludge consistency in the 1.4-1.5% solids range for a kraft mill in Port Townsend, Washington. The sensor element is attached to a measuring shaft and a propeller is attached to the drive shaft. The shafts are connected by a rubber torque coupling. The propeller feeds the sensing element with pulp of actual consistency and as the element rotates through the pulp, a movement is produced on the measuring shaft. The relative torque of the measuring shaft to the drive shaft is measured according to the force balance principle and a signal linear to consistency is provided. This signal directs a controller to open or close a valve which adds enough higher solids stock or water to attain the needed viscosity range. This process is very useful for dewatering sludges from clarifier underflows. The filter has a permanent, stainless steel coil spring arrangement in a corduroy fashion around the drum, producing a greater projected drainage area. The arrangement of the spring layers allows complete media washing and positive cake discharge. Sludge is continuously fed from the filter to the press where two revolving press wheels with perforated screen plate facings carry sludge to the point of maximum pressure. Easy discharge of the press cake into the discharge mechanisms is provided. The system recovers three tons/day of pulp to be burned for heat recovery. It requires little operating labor and low maintenance. (Collins-FIRL)
W77-07214

REDUCED WATER DEMAND--RESULT OF SWEDISH ANTI-POLLUTION PROGRAM,
M. Falkenmark.
Ambio, Vol 6, No 1, p 66-70, 1977. 7 fig, 2 tab, 10 ref.

Descriptors: *Water supply, *Water utilization, Water users, *Pollution abatement, Pulp and paper industry, Water purification, Legislation, Economics, Water reuse, *Waste water treatment, *Water demand.
Identifiers: Resource recovery, *Sweden.

Considerations involved in the reduction of a Swedish water demand were described. Antipollution and environmental protection legislation, as well as administrative, technological, and economical factors contributed to this reduction. The hydrologic conditions of Sweden were described and reviewed. Industrial water consumption and means of reducing it were illustrated by the example of the pulp and paper industry, the largest water user in Sweden. Modifications of existing and new mills and new techniques applied to reduce and treat discharged waste effluents contributed to environmental protection efforts. Water purification and water reuse have reduced the demand for water supplies. External methods of waste water treatment are generally not practiced. It was estimated that using the best available and most economically feasible treatment methods could reduce this industry's freshwater demand to about one-third of its 1971 usage. (Collins-FIRL)
W77-07215

AN OZONE REACTOR FOR COLOR REMOVAL FROM PULP BLEACHERY WASTES,
P. B. Melnyk, D. Judkins, and A. Netzer.
Tappi, Vol 60, No 3, p 97-100, March, 1977. 4 fig, 2 tab, 8 ref.

Descriptors: *Color, *Ozone, *Bleaching wastes, *Pulp wastes, Chemical reactions, *Mass transfer, Waste treatment, Pulp and paper industry, Costs, Industrial wastes, *Waste water treatment.
Identifiers: *Ozone reactors.

An experimental ozone reactor was used to investigate color removal from pulp bleachery wastes. The influent was from a softwood kraft pulp mill with a color concentration of 1300-1400 milligrams/liter. Kinetic data revealed that color removal rates were determined by chemical reaction and mass transfer. These rates are strongly dependent upon chromogenic lignin concentrations. Ozone concentrations had some effect on color removal, but reactor temperature was of slight effect. BOD increased when color removal was less than 50%, and both COD and BOD decreased by about 40% when color removal approached 90%. At color concentrations of 500 milligrams/liter or less, color removal rate decrease and ozone uptake rate increase were exponential. The capital and operating costs for this process would best be kept to a minimum by either reducing the ozone production cost or the ozone requirement, rather than by increasing color removal rates. (Collins-FIRL)
W77-07216

DESIGN CONSIDERATIONS OF FOAM SEPARATION PROCESS FOR DETOXIFICATION OF KRAFT EFFLUENTS,
B. C. Research Ltd., Vancouver.
K. S. Ng, and P. Temoin.
Pulp and Paper Canada, Vol 78, No 2, p 37-42, February, 1977. 1 fig, 9 tab, 9 ref.

Descriptors: *Foam separation, *Pulp wastes, *Design criteria, Industrial wastes, Toxicity, Aeration, Liquid wastes, Bleaching wastes, Water pollution sources, Pollution abatement, Costs, Equipment, *Waste water treatment.
Identifiers: *Detoxification(Kraft mills).

Design criteria were presented for a process to detoxify kraft mill effluents by foam separation. All considerations were for a plant with a 25 mgd flow. The jet aeration system was recommended for foam generation because it produces very uniform bubbles and foaming is copious. A thorough mixing motion is produced from a strong plume, and the system appears to be the most consistent in the production of fine bubbles. It also is simple to operate and requires minimum maintenance expenses. The turbine-centrifugal system used for black liquor oxidation systems in many pulp mills is recommended for large-scale foam breaking. It produces a suction force which improves the rate of foam removal. Commercial turbine systems can be installed over the top of a foam separator. This has the advantage of equally distributing the suction force over a large foam surface. Separate discharge of collapsed foam to a foam treatment system is an integral component of the design. Operating costs were estimated to be $2.44/ton of pulp for a 25 mgd foam separation plant, including foam treatment and foam breaking, based on 1975 costs. (Collins-FIRL)
W77-07217

GREAT LAKES PAPER LAUNCHES FIRST CLOSED-CYCLE KRAFT PULP MILL.
Paper Trade Journal, Vol 161, No 6, p 29-32, March, 1977. 3 fig.

Descriptors: *Pulp wastes, *Bleaching wastes, Water pollution sources, *Water reuse, *Pollution abatement, Pulp and paper industry, Waste treatment, Liquid wastes, Industrial wastes, *Waste water treatment.
Identifiers: *Closed-cycle kraft mill.

A bleached kraft market pulp mill with a closed-cycle effluent treatment system was constructed in Canada. The process consists of recycling bleach plant effluents through a standard black liquor recovery cycle and separating salt from the resulting white liquor. This salt is the basic material for manufacturing chlorine dioxide. Changes in operating procedure involve the replacement of chlorine with chlorine dioxide in the first bleaching stage, high-temperature chlorination, and countercurrent washing during the bleaching cycle. White water is recycled for further use, and small amounts of freshwater are used to prevent evaporator overloading. The screening and cleaning systems are closed. The installation of special equipment allows salt recovery. This system's advantages are: lower steam consumption with greater steam production; a 1% decrease in fiber loss from screening, washing, and other operations; a 1% increase in bleached pulp yield; lower consumption of bleach chemicals; reduced salt cake and defoamer use; lower water consumption, and the elimination of external waste treatment. (Collins-FIRL)
W77-07218

FIFTY MILLION DOLLARS IS A LOT OF FISH,
L. Webster, and F. Stevens.
Pulp and Paper Canada, Vol 78, No 3, p 11-13, March, 1977. 1 fig.

Descriptors: *Treatment facilities, *Water reuse, *Water purification, Industrial wastes, Pulp wastes, Pulp and paper industry, *Waste water treatment, Pollution abatement, Water pollution sources, Water quality control, *Canada.

A spent liquor recovery plant is being constructed at Port Alice, British Columbia, to bring an ammonia-base sulfite mill effluent discharge up to levels needed to meet environmental protection requirements. Pulp from existing digesters will be discharged to a new blow tank and washed pulp will go to stock tanks, while 90-95% of the red liquor will be filtered for residual fiber removal and passed to the feed tank of the multiple-effect falling-film evaporator. The processed liquor, containing 48-50% solids, moves to the recovery boiler via the storage tanks. High-pressure steam from the boiler will drive a turbogenerator. All NH3 is burned and SO2 in the flue gas is absorbed in aqueous ammonia. Hot water is to be recovered by heat exchangers. Ammonium bisulfite liquor is filtered, stored, and pumped to the acid plant. (Collins-FIRL)
W77-07219

THE DESALTING AND RECYCLING OF WASTE WATERS FROM TEXTILE DYEING OPERATIONS USING REVERSE OSMOSIS,
Mansoura Univ. (Egypt). Dept. of Mechanical Engineering.
A. M. El-Nashar.
Desalination, Vol 20, p 267-277, 1977. 6 fig, 4 tab, 2 ref.

Descriptors: *Dyes, *Textiles, *Reverse osmosis, *Desalination, *Water reuse, Pilot plant, Separation techniques, Industrial wastes, Waste treatment, Water purification, Waste water treatment, *Recycling.

The role of reverse osmosis in desalting and recycling textile dye waste waters was investigated. A pilot plant was constructed containing a precast membrane reverse osmosis loop and a dynamic membrane loop. The membrane materials used were polyamide, in a hollow fine fiber configuration; cellulose acetate, in spiral wound and tubular configurations; and hydrous ZZr(IV)-polyacrylate, in a tubular configuration. Dye process waste water was separated into a stream rich in salts and dyes and a purified water stream. The membranes suffered from a tendency to

become fouled with the inorganic or organic colloids in the feed solution. Flushing with tap water after each loop shut down prevented bacterial growth on the membranes. The feed was subjected to prefiltration and pH adjustment before reverse osmosis was applied. The test results indicated that the product water from each module could be recycled in the dyeing process. (Collins-FIRL)
W77-07220

DYEHOUSE WATER TREATMENT WITH CATALYTIC OXIDATION.
International Dyer, Textile Printer, Bleacher, and Finisher, p 176, 179-180, February 18, 1977. 1 fig.

Descriptors: *Dyes, *Oxidation, *Pilot plants, *Textiles, Industrial wastes, Liquid wastes, Treatment facilities, Biological treatment, Equipment, Desalination, Sedimentation, Organic matter, Flocculation, *Waste water treatment.
Identifiers: *Catalytic oxidation, Chemical treatment.

A pilot study was conducted for the treatment of effluents from a British dyehouse. Problems involved in treating these effluents included: variations in the amounts of waste water impurities, pH values, temperature, suspended matter, and salt content. Effluent regulations and the availability of water are also important considerations. Several means of treatment are available. The effluent can be diluted with city effluent at a rate of 1:6 or 1:8 in a biological sewage treatment plant, or it can be pretreated before passage to biological treatment plants. In the latter case, it may be neutralized by combustion gas or neutralized and chemically precipitated with ferric sulfate or aluminum sulfate. Chemical precipitation leads to sediment problems. A multi-stage treatment scheme based on catalytic oxidation from organic matter, was developed to treat effluents which are to enter municipal treatment plants, to be discharged to a river, or to be used for complete water recycling. There is a compensating basin for buffering the concentration. An oxidation stage decolors effluent and oxidizes organic matter, producing organic matter reductions of 30-60%. The remaining organic matter is removed by coagulation with the aid of flocculating agents. Polyelectrolytes can accelerate the sedimentation of flocs. The sediment is dehydrated and disposed. A two-stage desalination unit is designed for a residual salt content of 500-700 milligrams/liter. The process can reduce COD by 85-95%. (Collins-FIRL)
W77-07221

PURIFICATION OF INDUSTRIAL WASTE WATER CONTAINING ORGANIC IMPURITIES--BY CONTACTING WITH ADSORBENT POLYMER MATERIAL IN SOLVATED GEL STATE.
Netherlands Patent NL 7606-582. Issued December 21, 1976. Derwent Netherlands Patents Abstracts, Vol Y, No 2, p D2, February 18, 1977.

Descriptors: *Patents, *Water purification, *Textiles, *Polymers, *Waste water treatment, Surfactants, Pollution abatement, Temperature, Separation techniques, Industrial wastes.

A patent was issued for a waste water purification system for the textile industry. The process involves contacting water with an adsorbent polymer material in a solvated gel state. About 100% of the contaminants are eliminated and treated water can be recycled. Anionic, cationic, and nonionic surfactants are also removed by this process. Any number of adsorbent polymers may be used. A temperature up to 100 C can be used, but the most effective range is between 10 and 70 C when employing a fixed bed process. The most effective polymer is of a hydrated gel with a molecular weight of 500, and a specific surface of 30 sq m/gram. A synthetic thermoplastic polymer in a spun fiber form with a thickness of 0.2-20 denier is preferred. Other useful polymers include a polyamide, an anionically modified polyamide, a linear polyester, and a linear polyester modified with an acid or an acrylonitrile polymer. Other applications are in the paper, leather, and dye industries. (Collins-FIRL)
W77-07222

TREATING EFFLUENT CONTAINING IONIC COMPOUNDS PREFERABLY DYES--BY ADDING SALT GENERATOR OF OPPOSITE CHARGE TO EFFLUENT ION THEN ULTRAFILTERING.
French Patent FR 2302-122. Issued October 29, 1976. Derwent French Patents Abstracts, Vol Y, No 1, p D3, February 14, 1977.

Descriptors: *Patents, *Filtration, *Tannery wastes, *Ion exchange, Salts, Liquid wastes, Waste treatment, Industrial wastes, Membrane processes, *Waste water treatment, Chemical reactions, Separation techniques.
Identifiers: Ionic compounds, *Ultrafiltration.

A patent was issued for a process to remove water-soluble ionic compounds from aqueous solutions. A water-soluble salt generator with a high molecular weight and a charge opposite that of the ionic compound is added. This is followed by ultra-filtration under pressure. A semi-permeable membrane allowing for high flow rate may be used with this process, although it would have been impractical for filtering untreated effluent. The method is suitable for treating tannery effluents containing ionic tanning agents or low concentrations of dyes. (Collins-FIRL)
W77-07223

TWO NEW METHODS OF SLUDGE REMOVAL,
Vallero, Cesare and Figli, Turin (Italy).
P. Vallero.
The Leather Manufacturer, Vol 94, No 2, p 10-13, February, 1977.

Descriptors: *Tannery wastes, *Sludge treatment, Equipment, Sedimentation, *Filtration, Solid wastes, Industrial wastes, Dewatering, Chrome, Lime, Polyelectrolytes, Polymers, *Waste water treatment, Sludge disposal, *Filters.
Identifiers: Resource recovery, *Rotary filters, *Idronova hydrodynamic filters.

An Italian manufacturer has developed two new sludge disposal methods, the Idronova hydrodynamic filter, or sedimentator; and the Idronova rotary filter, or sludge concentrator. The sedimentator removes sludge from hair pulp solutions to allow recycling of sulfide, settles and regenerates chrome from exhaust chrome liquors, and clarifies and settles all tannery effluents. The sludge concentrator can dewater tannery sludge from 2 to 3% total solids to about 20% at up to 1600 imperial gallons/hour. This unit is self-cleaning, automatic, uncomplicated, and can concentrate precipitated chrome to 1/10 its original volume. The sedimentator can permit continuous recycling of lime liquors. About 50-70% of the sulfide can be salvaged, restrengthened, and reused. One advantage of this method is a smoother, softer leather. BOD5 reductions also occur, but percentages of reduction are not available. The sedimentator can also be used as a filter, in addition to providing skimming and settling without moving parts. Chrome recovery can be accomplished in a similar manner with the addition of polyelectrolyte to aid coagulation and settling. The rotary filter accomplishes chrome recovery with the aid of polymers. It is a rotating screen along which solids are moved by baffles. Chemical and biological treatment may be necessary with these methods if sewage limits are exceeded. (Collins-FIRL)
W77-07224

A MINI-POLLUTION TANNERY,
Environmental Protection Agency, Kansas City, Mo. Region VII.
W. L. Banks.
Journal of the American Leather Chemists Association, Vol. 72, No. 2, p 62-68, February, 1977. 1 fig.

Descriptors: *Tannery wastes, Water pollution sources, *Pollution abatement, Waste treatment, Industrial wastes, Water purification, Water reuse, Treatment facilities, Equipment, Biological treatment, Environmental control, *Waste water treatment, Design criteria, Costs.
Identifiers: Chemical treatment.

A tannery design was proposed to avoid or reduce potential pollution problems. Recommendations were presented for handling the hide in an efficient manner. Various chemical and biological treatment processes for production waste streams were discussed in terms of the different process steps involved. Automatic control of solution quantities and computer calculation of variables, such as times, weights, temperatures, and ingredients were suggested. Reusing purified water and reclaiming chemical and metal resources were primary concerns. Two processing systems were considered for the pollution treatment section. One was a conventional physical, chemical, and biological process. The other employed dilution with a silt laden stream. It was noted that this tannery design was a hypothetical one which assumed unlimited financial resources for implementation. (Collins-FIRL)
W77-07225

PURIFYING WASTE LIQUOR CONTAINING SULPHIDE, SULPHITE AND THIOSULPHATE-ALKALINE OXIDATION FOLLOWED BY ACID OXIDATION, USING OXYGEN.
Belgian Patent BE 844-891. Issued February 7, 1977. Derwent Belgian Patents Abstracts, Vol. Y, No. 6, p D4, March 16, 1977.

Descriptors: *Patents, *Oxidation, *Sulfur compounds, Industrial wastes, Liquid wastes, Pulp wastes, Pulp and paper industry, Oxygen, Chemical reactions, Water purification, Air pollution sources, Pollution abatement, *Waste water treatment.

A patent was issued for an oxidation process to treat waste liquor containing sulfides, sulfites, thiosulfates, or their mixtures. The effluent is reacted with oxygen at pH 7, at 20-200 C, and under approximately 20 bars pressure for the conversion of sulfide to thiosulfates. The water is then treated with oxygen, under the same conditions, at pH 0-5 or, if it only contains sulfites, at pH 0.8. This is done in the presence of catalysts to form sulfates with sulfur if the liquor contains sulfides and/or thiosulfate. Effluents from the paper and dye industries are treated by this process. With this method rapid oxidation to sulfate occurs at low temperatures and pressures. Air oxidation is slow, and if sulfite is present, sulfur dioxide is formed which produces atmospheric pollution problems. (Collins-FIRL)
W77-07226

EVAPORATION AND THERMAL OXIDATION OF LIQUID EFFLUENTS--BY BURNING WITH FLAME IN COMBUSTION CHAMBER.
French Patent FR 2302-483. Issued October 29, 1976. Issued October 29, 1976. Derwent French Patents Abstracts, Vol. Y, No. 1, p D5, February 14, 1977.

Descriptors: *Patents, *Oil wastes, *Evaporation, *Oxidation, Heat treatment, Industrial wastes, Equipment, Fuels, *Waste water treatment, Waste disposal, Toxicity, *Incineration.
Identifiers: *Thermal oxidation.

A patent was issued for a process to treat effluents containing toxic products from refineries and plants which chemically treat petroleum products. A continuous evaporation process is created and combustible substances are burned and eliminated by thermal oxidation. The effluent is vaporized by convection currents in the combustion chamber. Solid wastes can be burned along with the effluent products by mixing with the fuel. (Collins-FIRL)
W77-07227

P. L. 92-500 V LOCAL PRIORITIES,
Brown and Caldwell, Seattle, Wash.
R. C. Bain.
Water and Wastes Engineering, Vol 13, No 7, p 72-74, 101, July 1976.

Descriptors: *Priorities, *Water policy, *Federal Water Pollution Control Act, Treatment, Water pollution treatment, Water treatment, Treatment facilities, Water law, Water pollution, Water quality, Constraints, Legal aspects, Secondary treatment, Water quality standards, Water quality control, Regulation, Planning, Facilities, Flexibility, Local governments.
Identifiers: *National Environmental Policy Act, *P. L. 92-500, *Federal Water Pollution Control Act(FWPCA) Amendments of 1972, Merit alternatives, Environmental risk maps.

PL 92-500 calls for blanket secondary treatment for all plants discharging to surface waters regardless of local water quality needs. Current Environmental Protection Agency (EPA) priorities also focus on treatment plant upgrading. However, in many areas such as Seattle, treatment plant upgrading raises site questions associated with local land and shoreline use. In some instances adherence to the mandate of PL 92-500 will produce no measurable water quality benefit to surrounding waters. To enable more relevant pollution control measures to be pursued at a local level, flexibility in the law is needed. In Seattle, the strategy for meeting the 1983 Water Quality goal has been to develop merit alternatives which favor solving local concerns such as combined sewer overflow control. These merit alternatives are not constrained by the legal requirements of PL 92-500. To ensure effective application of these merit alternatives, priority systems are being developed with the aid of environmental risk maps. A comparison of the costs and benefits associated with the legal alternatives of PL 92-500 and those of the merit alternatives will provide a forum for debate over these two approaches to water quality control. (Petruff-Florida)
W77-07229

BRACE RESEARCH INSTITUTE, ANNUAL REPORT, (1976),
Macdonald Coll. Montreal (Quebec). Brace Research Inst.
For primary bibliographic entry see Field 3A.
W77-07242

THERMAL POLLUTION AND ITS CONTROL,
Washington Univ., St. Louis, Mo. Dept. of Chemical Engineering; and Washington Univ., St. Louis, Mo. Program in Technology and Human Affairs.
For primary bibliographic entry see Field 5G.
W77-07245

HOW THE ARMY DOES A BANG-UP JOB OF TREATING EFFLUENTS,
Picatinny Arsenal, Dover, N.J. Modernization and Special Technology Div.
A. Carotti, and J. C. Thomas.
Environmental Science and Technology, Vol 10, No 8, p 751-56, August 1976. 3 illus.

Descriptors: *Effluents, *Waste water treatment, *Industrial wastes, *Waste water(Pollution), Wastes, Water pollution, Abatement, Treatment, Water pollution control, Discharge(Water), Pollutants, Industrial water, Water pollution sources, Chemical wastes, Pollution abatement, Water treatment, Recycling, Federal Water Pollution Control Act.
Identifiers: *Nitrocellulose, *Acetic anhydride, *Trinitrotoluene(TNT), *Sodium nitrate, *Federal Water Pollution Control Act(FWPCA) Amendments of 1972.

An extensive effort to eliminate pollution from Army Ammunition Plants (AAP), which was begun as early as 1968, gained added impetus from the 1972 Federal Water Pollution Control Act (FWPCA) Amendments, which directs this country toward a national goal of eliminating the discharge of pollutants into navigable waters. The importance of water management as a tool for water pollution abatement has been recognized, so that concentrated efforts are being expended in this direction to insure timely compliance with future effluent standards. The key concept in the water management program is the consideration of total plant water utilization, thus avoiding traditional reliance upon treatment for discharge for standards achievement. The methodology of abatement of plant scale water pollution is best resolved by using a mixture of such strategies as: improved product recovery, recycle of acceptable wastewater for repeat operation, recycle of effluent to concentrate contaminants to permit their economic recovery, and wastewater treatment. Water management schemes for nitrocellulose manufacture, TNT manufacture, acetic anhydride manufacture, and sodium nitrate recovery are described in detail. (Petruff-Florida)
W77-07247

ECONOMIC ASPECTS OF POLLUTION ABATEMENT, PART I,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07260

LEGAL ASPECTS OF CHANGES BROUGHT ABOUT BY BUCKEYE'S POLLUTION ABATEMENT PROGRAM, PART II,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07261

EVAPORATION OF WASTEWATER FROM MOUNTAIN CABINS,
Colorado State Univ., Fort Collins, Solar Energy Applications Lab.
For primary bibliographic entry see Field 5E.
W77-07284

OZONATION IN A BETTER PERSPECTIVE,
C. Winklehaus.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 190-193, February, 1977.

Descriptors: *Ozone, Water purification, *Chlorination, *Disinfection, *Water treatment, Biodegradation, *Waste water treatment, Byproducts, Toxicity.
Identifiers: Chlorine dioxide, Bromine chloride, Ferrate ion, *Ozonation.

While recent attention to the harmful halogenated organic byproducts of disinfection by chlorination has resulted in much publicity for ozonation as the obvious alternative, ozonation's disadvantages should not be overlooked completely. A recent workshop sponsored by the EPA and the International Ozone Institute focused on both the advantages of ozonation (higher potency as a disinfectant and chemical oxidant than chlorine, oxygen rather than halogenated organics as principal byproduct) as well as its drawbacks (generally higher cost than chlorine and lack of residual disinfectant action). Some toxic byproducts do result from ozone reactions with organic compounds, however these byproducts are usually unstable, their formation and breakdown rates being dependent on ozone concentration in the water; in many cases, the intermediaries are more biodegradable than the organics from which they were formed. Other disinfectants were discussed during the workshop, notably chlorine dioxide, bromine chloride, and the ferrate ion. The assessment of ozonation's potential based on European experience is to view ozone treatment as a unit process in combination with chlorine and chlorine dioxide treatment, and that ozonation will produce fewer harmful intermediaries and byproducts than chlorination alone. (Eberle-NWWA)
W77-07293

INFLUENCE OF AN OZONISATION PLANT ON THE BACTERIAL CONTENT IN WATER OF A DEMONSTRATION AQUARIUM,
Kiel Univ. (West Germany).
For primary bibliographic entry see Field 5C.
W77-07311

PROCEEDINGS OF THE ANNUAL CONFERENCE, APRIL 20-23, 1975, TORONTO, ONTARIO,
American Water Works Association, Toronto (Ontario). Ontario Section.
Environment Canada, Environmental Protection Service, Ottawa, Canada, 1976, 429 p.

Descriptors: *Canada, *Conferences, *Water pollution, *Water quality, Water pollution control, Water pollution sources, Industrial wastes, Water pollution treatment, Waste treatment, Chlorination, Environmental control, Environmental sanitation, Water supply, Water works, *Waste water treatment, *Water treatment.
Identifiers: Ontario.

The conference proceedings of the annual conference involving the Ontario Section of the American Water Works Association, the Pollution Control Association of Ontario, and the Ontario Municipal Water Association, are contained in this book. The conference was held in Toronto on April 20-23, 1975. Basically, the conference dealt with water pollution sources, water treatment facilities and operation, water works designs and Environmental engineering. The six sessions of the conference were: (1) an introductory session; (2) the Pollution Control Association of Ontario session ; (3) the American Water Works Association section, dealing with chemical and engineering aspect of waste water treatment and water purification; (4) the Ontario Municipal Water Association session which was concerned with Ontario programs and examples; (5) a joint operations forum which dealt with management and training programs; and (6) a joint session which discussed future problems, environmental sanitation in the north, and waste water treatment effluents. (WATDOC)
W77-07329

PROCEEDINGS, TECHNOLOGY TRANSFER SEMINAR ON HIGH QUALITY EFFLUENTS,
Environmental Protection Service, Ottawa (Ontario). Water Training and Technology Transfer Div.
Canada-Ontario Agreement on the Great Lakes Water Quality, Environment Canada, Ottawa, Canada. Held in Toronto, Ontario, December 2-3, 1975. Published March, 1976, 371 p.

Descriptors: *Conference, *Effluents, *Waste water treatment, *Water pollution control, Treatment facilities, Model studies, Water quality, Filtration, Waste water disposal, Wastes, Technology, *Waste water treatment.
Identifiers: *High quality effluents, *Technology transfer.

The seminar on high quality effluents was planned with two axioms in mind, namely: a particular environmental area can assimilate only a finite quan-

tity of pollution; and, with the inevitable increase in the production of pollutants resulting from economic growth and urbanization, the degree of treatment must be improved. The seminar was designed to discuss, many of the questions concerning the need for higher quality effluents. (WATDOC)
W77-07330

WASTEWATER AND SLUDGE CONTROL IN THE CANADIAN METAL FINISHING INDUSTRY, SEGMENT INCLUDING CHEMICAL, ELECTROLYTIC TREATMENT; ELECTROCHEMICAL MACHINING AND POLISHING; CYANIDE HARDENING,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
L. Buffa, and K. Coulter.
Economic and Technical Review Report, No. EPS 3-WP-76-10, December, 1976, 33 p., 1 fig., 5 tab, 7 ref, 2 append.

Descriptors: *Metals, Waste water(Pollution), *Sludge, Control, Effluents, *Industrial wastes, Technology, *Canada, Sewers, *Waste water treatment, Costs, Chemical wastes, Pollution abatement, *Electrolysis, Electrochemistry.
Identifiers: *Metal finishing industry wastes, *Fisheries Act(Canada).

Described are technical and economic aspects of the development, under the Fisheries Act, of national effluent requirements for the segment of the Canadian metal finishing industry which includes chemical and electrolytic finishing of surfaces and cyanide hardening. Recommendations for the control of effluents are presented, based on the best practicable technology and economic considerations. (WATDOC)
W77-07333

LAND APPLICATION OF DIGESTED SLUDGE UNDER ADVERSE CONDITIONS.
Regional Municipality of Niagara, Niagara Falls (Ontario). Public Works Dept.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No, 53, Environmental Protection Service, Environment Canada, Ottawa, Canada, 55 p., 32 fig., 11 tab, 12 ref, 2 append.

Descriptors: *Sewage, *Sludge, *Rain, *Melting, Application methods, Soil disposal fields, Waste disposal, Equipment, Crop production, Weather, Water spreading, Costs, Time lag, Spraying, Frozen soils, *Water reuse, Waste treatment, *Canada.
Identifiers: Vehicles, Niagara, Ontario.

The disposal of sludge on land which, because of continual periods of rain or spring melting conditions, had become impassable to normal sludge hauling vehichles (tank trucks). The reasons for this concern were: (1) the deterioration of the sewage treatment plant effluent quality if sludge removal cannot be carried our for an extended period, and (2) the cost of sludge holding facilities in adverse conditions. Initially, two separate literature reviews were conducted: (2) The first was made to determine current equipment used in sludge application to land and to assess potential problems associated with the equipment to be tested. Little written information was available on this topic and it was necessary to obtain data by personal communication. (2) Agricultural literature on soil compaction was reviewed to determine the effects of vehicular traffic on soil. Five vehicles (a tank truck, a sludge injector, a bulldozer, a front-end loader and an all-terrain vehicle) were field tested and evaluated. A system for sludge spraying was also investigated. Soil compaction analyses, crop analyses, problems experienced, and breakdowns encountered during spreading were used as parameters for evaluation. None of the vehicles investigated proved ideally suitable and effective in the spreading of sludge on wet soils. Spraying of sludge proved to be the most suitable method for land application under certain weather conditions but was suitable only for well-screened sludge. (WATDOC)
W77-07337

REVIEW OF TREATMENT TECHNOLOGY IN THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA.
Stanley Associates Engineering Ltd., Edmonton (Alberta).
Economic and Technical Review Report, No EPS 3-WP-77-5, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, March, 1977. 207 p, 19 fig, 89 tab, 18 ref, 2 append.

Descriptors: *Reviews, *Treatment, Technology, Solid wastes, Industrial crops, Vegetable crops, Waste water, Sedimentation, Food processing industry, Fruit crops, Wastes, Waste treatment, *Waste water treatment, *Canada, Costs, Screens, Flotation, Filtration, Control Toxicity, Lagoons.
Identifiers: *Processing plants, Washwater, *Fruit and vegetable processing industry.

A review is presented of the state-of-the-art of wastewater treatment in the Canadian fruit and vegetable industry. The findings are based on data from eight plants and are not an inventory of Canadian processing plants. Because the fruit and vegetable industry is both wide ranging and complex, 11 major commodities were designated for study. Additionally, investigators used much available data from U.S. sources where a data bank on 650 processing plants exists. Only data which were pertinent to the Canadian scene were used Current technology and treatment practices were found to be very similar in both countries but spray irrigation treatment is more costly in Canada as climatic conditions generally require winter storage facilities. Other treatment methods include screening, sedimentation, flotation and biological treatment. Available U.S. and Canadian technology should produce a reduction of BOD5 and suspended solids greater than 90%. However, where receiving streams are small, even 90% reductions may not be sufficient, making polishing or land applications necessary. This report found that the BOD5 levels of the wastewaters discharged by the Canadian industry were generally high with a great potential for oxygen depletion in receiving waters. (WATDOC)
W77-07341

APPLICATION OF VASCULAR AQUATIC PLANTS FOR POLLUTION REMOVAL, ENERGY AND FOOD PRODUCTION IN A BIOLOGICAL SYSTEM,
National Space Technology Labs., Bay St. Louis, Miss.
B. C. Wolverton, R. M. Barlow, and R. C. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-22938, Price codes: A02 in paper copy, A01 in microfiche. NASA TM-X-72726, May 1975. 17 p. 7 fig., 19 ref.

Descriptors: *Aquatic plants, *Pollution abatement, *Water hyacinth, *Alligator weed, Nitrogen, Phosphorus, Heavy metals, Phenols, Chemical wastes, Sewage disposal, Harvesting, Laboratory tests, Filtration, Energy conversion, Feeds, Food, *Waste water treatment.
Identifiers: *Pollutant removal.

Laboratory results of NASA/National Space Technology Laboratories investigations to determine the pollution removal capabilities of vascular aquatic plants are reported. Results suggest that aquatic plants, such as water hyacinths and alligator weeds, may represent a very efficient and inexpensive filtration and disposal system for toxic materials and sewage released into waters, when utilized in a controlled biological system which includes a regular program of harvesting to achieve maximum growth and pollution removal efficiency. One acre of water hyacinths has the potential to remove over 3500 pounds of nitrogen and over 800 pounds of phosphorus annually from sewage effluent, to absorb and metabolize over 150 pounds of phenol every 72 hours, and to remove over 120 grams of trace heavy metal contaminants every 24 hours. This same acre has the potential of producing over 70 tons of dry plant material annually which could be used for animal feeds and human food, or could produce over one million cubic of biogas through anaerobic decomposition with 70 tons of residual high-grade fertilizer as a byproduct. A biological system for removing chemical and sewage pollutants from waste waters and a potentially self-sufficient agricultural homestead, are both conceptually illustrated. (Luedtke-Wisconsin)
W77-07474

WATER QUALITY CRITERIA AND WASTE WATER TREATMENT,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
L. Landner.
Report IVL B 313, June 1976. 31 p. 3 fig., 11 tab.

Descriptors: *Water quality standards, *Industrial wastes, *Sewage treatment, *Foreign countries, Water pollution control, Safety, Permits, Water utilization, Sewerage, Hazards, Waste treatment, Sewage effluents, Treatment facilities, Efficiences, Regulation, Water policy.
Identifiers: *Sweden.

The Swedish approach to water pollution control relates water quality criteria to specific water uses and a defined limit for a particular parameter at a given locality, with the latter based on threshold value. This value designates at what concentration of a given parameter, under well-defined experimental conditions, a specified effect begins to take place. Waste discharges are restricted by a permit system incorporating detailed, individual conditions regarding types and amount of discharges, which are monitored by a network of environment control officers. The philosophy behind the Swedish attitude is that pollutant discharges should not be tolerated if they can be avoided by use of current, economically-feasible technology, regardless of effects on receiving waters. Several proposals for 'limit values' for industrial wastes are aimed at avoiding damage to sewer systems, to treatment plants using biological and chemical methods, and at limiting effects on receiving waters (or soil) based on 1/10th lethal concentrations for an unspecified fish species. Various methods of urban sewage treatment are outlined and their efficiences compared. (Auen-Wisconsin)
W77-07522

NETWORK APPROACH TO OPTIMAL WASTEWATER TREATMENT SYSTEM DESIGN,
Toronto Univ. (Ontario).
B. J. Adams, and D. Panagiotakopoulos.
Journal of the Water Pollution Control Federation, Vol. 49, No. 4, p 623-632, April 1977. 4 fig, 4 tab, 6 ref.

Descriptors: *Waste water treatment, *Water pollution control, *Design, *Optimization, Economic efficiency, Networks, Methodology, Algorithms, Biochemical oxygen demand, Linear programming, Effluents, Standards, Costs, Equations, Mathematical models, Operations research.
Identifiers: *Network algorithm, Cost minimization.

The design of a wastewate treatment system is considered to be the selection of treatment processes that form the system and the selection of efficiencies at which these processes will be operated. The optimal design is a least cost design that meets a required effluent standard. Compared are the shortcomings of previous approaches to the solution of this problem in terms of their sim-

plifying assumptions and proposed is a linear programming approach which is based on a network algorithm. The network approach is facile to apply, computationally convenient, and overcomes the problems of a number of previous simplifying assumptions. (Bell-Cornell)
W77-07531

ECONOMIC VALUE OF LOW FLOW DATA,
Technical Univ. of Denmark, Copenhagen.
J. C. Refsgaard, and E. Hansen.
Nordic Hydrology, Vol. 7, No. 1, p 57-72, 1976. 5 fig, 2 tab, 10 ref.

Descriptors: *Economics, *Value, *Low flow, *Hydrologic data, *Water resources, Decision making, Design, Treatment plants, Streamflow, Regression analysis, Evaluation, Digital computers, Costs, Probability, Mathematical models, Systems analysis.
Identifiers: *Bayesian decision approach, Denmark, Opportunity loss, Heuristic method, Uncertainty, Rainfall-runoff model, Goal function.

Utilizing the Bayesian decision approach, the economic value of low flow data is considered with special reference to the design of treatment plants for typical Danish conditions. For a specific case, the worth of primary data in the form of direct observations of low streamflows has been investigated in terms of an expected opportunity loss (EOL). Indirect information concerning the low flow properties of interest may be obtained by means of a secondary data set in combination with a regression model. Suggested is a heuristic method for the economic evaluation of a secondary set of data taking into account the uncertainty embedded in the regression model. Examined are the costs in the cases of both underdesign and overdesign. Discussed are the results of the computations of Bayes Risk, Bayes Solution, and EOL made on a digital computer. Finally, the potential economic benefits of transmitting information on low flows by means of a rainfall-runoff model are considered. (Bell-Cornell)
W77-07537

EVALUATING ALTERNATIVE LEVELS OF WATER AND SANITATION SERVICE FOR COMMUNITIES IN THE NORTHWEST TERRITORIES,
Associated Engineering Services Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 6A.
W77-07557

VACUUM SEWER SYSTEMS AND THEIR POSSIBLE CANADIAN APPLICATIONS,
Project Planning Associates Ltd., Toronto (Ontario).
D. W. Averill, and G. W. Heinke.
Canadian Journal of Civil Engineering, Vol 1, No 1, p 50-61, September 1974. 5 fig, 2 ref.

Descriptors: *Canada, *Sewers, *Waste water(Pollution), *Flow, Pipes, Networks, Design, Operating costs, Capital costs, Water conveyance, Mathematical models, Equations.
Identifiers: *Waste water transport, *Vacuum sewer systems.

The basic principles of vacuum sewer systems are reviewed and their introduction to Canada is described. A vacuum sewer uses air pressure instead of gravity as the driving force for waste water transport. Waste water is moved in plugs, separated by air gaps, at high velocities through small diameter pipes. The pressure differential of about one-half atmosphere is created by a central vacuum pump. Specially designed vacuum toilets, valves, and a central collection tank complete the system. Discussed are vacuum transport theory and design practices, including flow theory and friction loss by a homogeneous model. The advantages of a vacuum sewer system over a conventional gravity system are its ability to transport waste water horizontally and to a certain extent upgrade, its much lower water usage, and its lower capital cost. However, the length, capacity, and lift potential of vacuum sewers are limited by the available pressure differential, which precludes their use in many cases. There appears to be considerable potential for their application in Canada, particularly in remote locations such as cottage areas and in the Arctic. (Bell-Cornell)
W77-07558

A BACTERIOLOGICAL INVESTIGATION OF MEAT PACKING PLANT EFFLUENTS IN THE PROVINCE OF ALBERTA WITH PARTICULAR EMPHASIS ON SALMONELLA,
Environmental Protection Service, Edmonton (Alberta). Northwest Region.
J. M. Vanderpost, and J. B. Bell.
In: A Bacteriological Investigation of Meat and Poultry Packing Plant Effluents, with Particular Emphasis on Salmonella, Economic and Technical Review Report EPS 3-WP-76-9, Ottawa, Canada, December, 1976, 74 p., 4 fig., 95 ref., 21 tab, append.

Descriptors: *Food processing industry, *Bacteria, *Salmonella, *Effluents, *Waste water treatment, Waste water(Pollution), Coliforms, Water analysis, Filtration, Disinfection, Antibiotics(Pesticides), Resistance, *Canada, Treatment facilities.
Identifiers: *Meat, *Packing plants, *Alberta, Food poisoning, Edmonton, Red Deer, Calgary, Slaughterhouses.

The waste treatment facilities and final effluents of eleven meat packing plants in the Province of Alberta were investigated primarily to determine the numbers of indicator bacteria and the presence of Salmonella. This was done to discover the efficiency of the treatment systems presently in operation in reducing bacterial numbers, and to establish the need for disinfection and for bacterial standards for these effluents. Data obtained showed that the final effluents were of very poor quality bacteriologically with numbers of indicator organisms comparable to those found in raw sewage. Primary treatment facilities were totally ineffective in reducing these bacterial numbers and in addition, Salmonella were isolated from the final effluents of 80% of the plants. Although secondary treatment was somewhat more efficient in reducing bacterial counts, again Salmonella were isolated from the final effluents. In total, 21 different serotypes were identified. Salmonella isolates were not antibiotic resistant, but certain coliform and fecal coliform isolates demonstrated resistance to chloramphenicol, tetracycline, and ampicillin. S. typhimurium cells survived up to 12 days in nutrient-free water, and Rainbow Trout fingerlings became carriers of these organisms when placed in water containing an inoculum of the cells. It is recommended that a bacterial standard be included in regulations controlling the quality of meat packing plants effluents and that disinfection be implemented. (See also W77-07561) (WATDOC)
W77-07560

SALMONELLA IN POULTRY PACKING PLANT EFFLUENTS,
Environmental Protection Service, Ottawa (Ontario).
A. B. Tennant, R. Toxopeus, J. A. P. Bastien, M. Beauchamp, and J. Vandewint.
In: A Bacteriological Investigation of Meat and Poultry Packing Plant Effluents, with Particular Emphasis on Salmonella, Economic and Technical Review Report EPS 3-WP-76-9, Ottawa, Canada, December, 1976, 74 p., 3 fig., 47 ref., 30 tab.

Descriptors: *Poultry, *Food processing industry, *Bacteria, *Salmonella, Effluents, Coliforms, Resistance, Chlorination, Disinfection, Wastes, On-site tests, *Canada, *Waste water treatment, Treatment facilities.
Identifiers: Bacteria counts, *Ontario.

Concern that salmonellae associatd with polultry production in Ontario may be recycled through the environment by the discharge of inadequately-treated waste effluents led to the conduct of three case studies of poultry processing plants in 1975. Salmonellae of various serotypes were shown to be present in raw and treated wastes at three large, well-operated plants. Data presented support the need for effective treatment and disinfection of such wastes if the problem of poultry-associated salmonellosis is to be contained. The incidence of antibiotic resistance among fecal coliforms and salmonellae isolated from the waste streams was evaluated. Methods for the isolation of salmonellae, as selected on the basis of comparative data obtained, are proposed for use in waste treatmet and effluent quality case studies of poultry plant operations. (See also W77-07560) (WATDOC)
W77-07561

PROCEEDINGS, WATER POLLUTION ABATEMENT TECHNOLOGY IN THE PULP AND PAPER INDUSTRY, (1975),
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Economic and Technical Review Report, EPS 3-WP-76-4, March, 1976, 220 p, 38 fig, 18 tab, 202 ref, 6 append.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Waste water treatment, Regulation, *Pollution abatement, Suspended solids, Fishkill, Toxicity, Adsorption, Ion exchange, Absorption, United States, Canada, *Industrial wastes, Dewatering, Biological treatment.
Identifiers: Chemical oxidation, Sludge dewatering.

This publication contains papers from the Proceedings of Seminars on Water Pollution Abatement Technology in the Pulp and Paper Industry held in Ottawa, Ontario, May 1st and 2nd, 1975; Moncton, New Brunswick, May 5th and 6th, 1975; and Prince George, British Columbia, May 21st and 22nd. The siminars were sponsored by Environment Canada, Environmental Protection Service and the Technical Section of the Canadian Pulp and Paper Association. Topics include regulation and waste characterization, suspended solids removal, biological waste treatment, fish toxicity, physical and chemical treatment, and sludge dewatering and handling practices. (WATDOC)
W77-07562

STUDIES ON VIRUS INACTIVATION BY CHLORINE DURING WATER DISINFECTION, (IN GERMAN),
Hygiene Institut Stadt., Nuermberg (West Germany).
For primary bibliographic entry see Field 5F.
W77-07595

5E. Ultimate Disposal Of Wastes

LEACHING CHARACTERISTICS OF POLLUTED DREDGINGS,
Hayward Baker Co., Odenton, Md.
For primary bibliographic entry see Field 5B.
W77-07158

CONVECTIVE-DISPERSION IN PERENNIAL STREAMS,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 5B.
W77-07160

TOXIC WASTE DISPOSAL,
Clyde River Purification Board, Glasgow (Scotland).

For primary bibliographic entry see Field 5G.
W77-07209

INLINE SENSOR TIGHTENS CONTROL ON SLUDGE CONSISTENCY TO WITHIN 1.4-1.5% SOLIDS,
Crown Zellerbach Corp., Port Townsend, Wash.
For primary bibliographic entry see Field 5D.
W77-07214

EVAPORATION OF WASTEWATER FROM MOUNTAIN CABINS,
Colorado State Univ., Fort Collins, Solar Energy Applications Lab.
J. C. Ward.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 712, Price codes: A07 in paper copy, A01 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 77, March, 1977. 123 p, 25 fig, 54 tab, 33 ref. OWRT A-020-COLO(2). 14-31-0001-5006.

Descriptors: *Evaporators, Elevation, *Air temperature, *Solar radiation, *Thermal Radiation, *Heat balance, *Waste water disposal, *Water temperature, Mountains, *Colorado.
Identifiers: *Waste water evaporators, Second homes, Long wave radiation, Average temperature, Latitude, Longitude.

Presented are the results of a study of wastewater evaporation and a comparison of this technique with other alternatives for the disposal of wastewater from second homes located in mountainous areas. The wastewater evaporation unit is covered with a transparent (to solar radiation) precipitation interceptor that also serves to reduce long wave radiation heat losses. Several experimental and 1 full scale wastewater evaporators were installed at 4 elevations ranging from 5,200 to 10,665 feet. These units were observed for a period of 3 years. Following this observational period, the experimental data were analyzed to obtain design and cost data as a function of elevation, latitude, and longitude. Analysis of the experimental data showed that wastewater evaporation is a technical and economically viable alternative for elevations up to abouut 11,000 or 12,000 feet in Colorado. Because of the manner in which the design equations were developed, the results can be applied anywhere in the counterminous United States, although the design and cost data developed for Colorado as an example may not be applicable. The design and cost data for other states can be derived using the equations, presented.
W77-07284

DEEP WELL INJECTION: SWEEPING THE PROBLEM UNDER THE CARPET,
For primary bibliographic entry see Field 5G.
W77-07295

STATUS REPORT ON ABATEMENT OF WATER POLLUTION FROM THE CANADIAN PETROLEUM REFINING INDUSTRY - 1975,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W77-07334

LAND APPLICATION OF DIGESTED SLUDGE UNDER ADVERSE CONDITIONS.
Regional Municipality of Niagara, Niagara Falls (Ontario). Public Works Dept.
For primary bibliographic entry see Field 5D.
W77-07337

DREDGED MATERIAL DISPOSAL EFFECTS AND ALTERNATIVES,
Army Engineers Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W77-07345

CONCEPTS FOR THE RECLAMATION OF DREDGED MATERIAL,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 8D.
W77-07352

AN INVESTIGATION ON THE DISPOSAL OF PIG EXCRETA IN KASUMIGAURA AREA, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07571

5F. Water Treatment and Quality Alteration

USE OF CATION POLYELECTROLYTES FOR WATER PURIFICATION FROM VIRUSES, (IN RUSSIAN),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
Yu I. Veitser, V. A. Ryabchenko, and N. A. Arbuzova.
Gig Sanit 3, p 10-13, 1976.

Descriptors: *Polyelectrolytes, Water purification, Bacteria, *Viruses, Cations, E coli, Bacteriophage, *Coagulation, *Flocculation, *Waste water treatment, *Water treatment.
Identifiers: Picornavirus, Poliovirus.

A search was made new coagulants and flocculants to improve the water purification properties of traditional substances and develop new organic reagents. The cation polyelectrolytes polyvinyl-N-benzyl-trimethylammonium chloride (VA-2), polyethylenimine (PEI-K) and polydimethylamino-methyl-N-acrylamide (KF-4) were tested for removal of T1 and T2 phages of Escherichia coli and the poliomyelitis virus LSC 2ab. Quantitative activity in 3001 tap and river water solutions treated with polyelectrolytes was demonstrated for the coliphages in indicator cultures of E. coli B and for the poliovirus in monkey kidney tissue cultures to be most reduced in 1-2 mg/l and 4-5 mg/l solutions of PEI-K and VA-2, respectively. The virus elimination mechanisms may be interaction of polyelectrolyte amion groups with carboxyl groups of the dicarboxylic acid of viral protein membranes, resulting in viral adsorption of the flocculant molecules, while some parts of the phages may combine with polyelectrolyte macromolecules to form larger 3-dimensional structures easily retained by filters.--Copyright 1977, Biological Abstracts, Inc.
W77-07108

OZONATION IN A BETTER PERSPECTIVE,
For primary bibliographic entry see Field 5D.
W77-07293

PROCEEDINGS OF THE ANNUAL CONFERENCE, APRIL 20-23, 1975, TORONTO, ONTARIO,
American Water Works Association, Toronto (Ontario). Ontario Section.
For primary bibliographic entry see Field 5D.
W77-07329

A STUDY OF ENVIRONMENT SANITATION ON THE WELLS IN JUNGNEUNG-DONG AREA, SEOUL, (IN KOREAN),
Korea Univ., Seoul. Coll. of Medicine.
For primary bibliographic entry see Field 5B.
W77-07475

EVALUATING ALTERNATIVE LEVELS OF WATER AND SANITATION SERVICE FOR COMMUNITIES IN THE NORTHWEST TERRITORIES,
Associated Engineering Services Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 6A.
W77-07557

BACTERIOLOGICAL QUALITY OF POULTRY-FARMS' WATER IN MINAS GERAIS STATE, BRAZIL: 1973, (IN PORTUGESE),
Universidade Federal de Minas Gerais, Belo Horizonte (Brazil). School of Veterinary Medicine.
F. Viana, E. C. Moreira, and M. Barbosa.
Arq Esc Vet Univ Fed Minas Gerais 27(2), p 119-124, 1975.

Descriptors: *Bacteriology, South America, *Farm wastes, Chlorination, *Poultry, Water pollution, *Water quality standards, Potable water, Public health, Sampling, Water supply, Water wells, *Water treatment.
Identifiers: *Brazil(Minas Gerais).

Water samples (80) from poultry farms in 22 countries were bacteriologically examined following the standards recommendation of the American Public Health Association (1971) and the potability standard characteristics for water described in state regulations. The percentages of potability were: superficial wells 12.8%, artesian supplies 18.2%, springs 12.5%, creeks and lakes 7.1%. The water supplies generally are in poor sanitary condition and at least chlorination should be used to treat them. --Copyright 1977, Biological Abstracts, Inc.
W77-07594

STUDIES ON VIRUS INACTIVATION BY CHLORINE DURING WATER DISINFECTION, (IN GERMAN),
Hygiene Institut Stadt., Nuermberg (West Germany).
S. Carlson, U. Haesselbarth, and F. W. Sohn.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Betriebshyg Praev Med, p 320-329. 1976.

Descriptors: *Disinfection, *Bacteria, *Viruses, *Chlorination, Human diseases, Water pollution, Oxidation reduction potential, Water treatment, Waste water treatment.
Identifiers: Adenovirus, *Virus, Inactivation, Picornavirus, Poliovirus.

Water-borne transmission of viral diseases and the problems involved in virus inactivation by water chlorination are discussed. In contrast to the amount of free C1, the value of the oxidation-reduction potential (ORP) was a criterion of virus inactivation. For virus inactivation, higher ORP values and longer periods of contact than for the killing of bacteria were necessary. To ensure the inactivation of poliovirus in water contaminated with organic substances, an ORP of +750 mV (0.3-0.6 mg/l free C1) should be maintained for 15-30 min. Adenovirus showed an almost identical resistance to inactivation. Possibilities for utilizing the mechanism of virus inactivation by the action of chemical disinfectants are discussed.--Copyright 1977, Biological Abstracts, Inc.
W77-07595

5G. Water Quality Control

INTERACTIONS OF CUPRIC ION WITH HUMIC ACID,
Missouri Univ. Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-07104

PRESENT AND HISTORICAL SPAWNING GROUNDS AND NURSERIES OF AMERICAN SHAD, ALOSA SAPIDISSIMA, IN THE DELAWARE RIVER,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
For primary bibliographic entry see Field 5C.
W77-07131

NONPOINT SOURCE EFFECTS ON WATER QUALITY,
Florida Technological Univ., Orlando.
For primary bibliographic entry see Field 5B.
W77-07173

DIPHENAMID REMOVAL FROM WATER AND METABOLISM BY AQUATIC PLANTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.
For primary bibliographic entry see Field 5C.
W77-07193

TOXIC WASTE DISPOSAL,
Clyde River Purification Board, Glasgow (Scotland).
R. Gray.
Water Pollution Control, Vol. 76, No. 1, p 30-38, 1977. 2 fig, 1 tab, 4 ref, 1 append.

Descriptors: *Waste disposal, *Metals, Toxicity, Pollutants, *Pollution abatement, Water pollution sources, Soil contamination, Solid wastes, Liquid wastes, *Industrial wastes, *Waste water treatment, Sludge treatment, Heavy metals.
Identifiers: *Toxic waste disposal.

A summary is presented of various methods for the disposal of toxic wastes which would meet British pollution control regulations. The disposal of metals is a prime consideration. The disposal of unneutralized cyanide is totally prohibited, and heavy metals must be precipitated to an insoluble form before land disposal. The reclamation of recoverable resources is especially attractive and applicable for metal wastes such as copper, nickel, tin, and cadmium. Chemical treatment is necessary for unrecoverable constituents of acid pickling wastes to be discharged to sewers and rivers. Chemical fixation and solidification are used to treat sludges and solutions containing heavy metals for land disposal. Disposal by tipping on land should involve total containment of the waste. Other types of pollutants from several industries are considered as well. Methods for their disposal are recommended and discussed. (Collins-FIRL)
W77-07209

REDUCED WATER DEMAND--RESULT OF SWEDISH ANTI-POLLUTION PROGRAM,
For primary bibliographic entry see Field 5D.
W77-07215

A MINI-POLLUTION TANNERY,
Environmental Protection Agency, Kansas City, Mo. Region VII.
For primary bibliographic entry see Field 5D.
W77-07225

P. L. 92-500 V LOCAL PRIORITIES,
Brown and Caldwell, Seattle, Wash.
For primary bibliographic entry see Field 5D.
W77-07229

POLLUTION SUSCEPTIBILITY: AN ENVIRONMENTAL PARAMETER FOR COASTAL ZONE MANAGEMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
P. K. Weyl.
Coastal Zone Management Journal, Vol 2, No 4, p 327-43, 1976. 5 fig.

Descriptors: *Tidal effects, *Federal Water Pollution Control Act, *Ocean currents, *Environmental effects, Water pollution, Environment, Diffusion, Currents(Water), Pollutants, Coasts, Tides, Ocean circulation, Dispersion, Movement, Flow, Bays.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Coastal waters, *Coastal zone management, *Non-point sources(Pollution), Pollution susceptibility, Steady state pollution susceptibility, Environmental parameter.

To facilitate compliance with the provisions of the Federal Water Pollution Control Act (FWPCA), a new environmental parameter, pollution susceptibility, has been developed. This parameter will enable the coastal zone manager to relate the concentration of pollutants in coastal water to the rates at which these pollutants are discharged by point and non-point sources. Readily determinable from available data on tidal heights and currents, pollution susceptibility, is a useful device that describes the susceptibility of coastal water to pollution. It allows one to distinguish which coastal areas would be highly affected by a given discharge. In restricted bays, a second parameter, steady state pollution susceptibility, takes into account the recirculation of pollutants. While it does not eliminate the need for site-specific impact studies, pollution susceptibility can be used as a tool for broad planning. However, it must be supplemented by more detailed local studies in order to assess the environmental impact of specific activities. (Petruff-Florida)
W77-07230

CONTROL OF AGRICULTURAL WATER POLLUTION: A CONTINUING REGULATORY DILEMA,
South Carolina Univ., Columbia. School of Law.
J. E. Montgomery.
University of Illinois Law Forum, Vol 1976, No 2, p 533-58, 1976.

Descriptors: *Federal Water Pollution Control Act, *Agricultural runoff, *Feed lots, *Pesticide residues, Erosion control, Erosion, Pesticides, Fertilizers, Agriculture, Pollutants, Pollutant identification, Permits, Animal control, State governments, Programs, Regulation.
Identifiers: *Federal Water Pollution Control Act (FWPCA) Amendments of 1972, Point sources, Nonpoint sources, National Pollutant Discharge Elimination System(NPDES), Environmental Protection Agency(EPA).

The Federal Water Pollution Control Act Amendments of 1972 (FWPCA) establish a comprehensive strategy for ending water pollution. Under the FWPCA, pollution from agricultural sources is divided into point sources (which include animal feeding operations) and nonpoint sources (which include erosion-transported pollutants such as pesticide and fertilizer residues). Discharge of pollutants from a point source into navigable water is illegal without a National Pollutant Discharge Elimination System Permit from EPA. Until 1975, regulation of small animal feedlots was outside the reach of the FWPCA due to exemptions created to protect small farmers. This exemption was challenged in National Resources Defense Council, Inc. v. Train; which held that the EPA did not have the authority to exempt whole categories stricter regulations are now being formulated to regulate all 'concentrated' animal feeding operations. The FWPCA still has no effective plan for regulation of nonpoint sources. Under the act, states must identify nonpoint source water pollutants and develop programs for control. The author suggests using Ohio's nonpoint source plan as a model and establishing federal coordination of state plans for uniformity. (Denker-Florida)
W77-07233

LOOKING AHEAD (FEDERAL WATER POLLUTION CONTROL ACT OF 1972).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-07235

HOUSE COMMITTEE MARKS UP HR 9560,
A. S. Heid.
Journal Water Pollution Control Federation, Vol. 48, No. 5, p. 812-15 (May 1976).

Descriptors: *Regulation, *Financing, *Federal-state water rights conflicts, Administrative regulations, Governments, Legal aspects, Water law, Water resources development, Capital, Grants, Project feasibility, Planning, Governments, Administrative agencies, State governments, Penalties(Legal), Assessments, Law enforcement, Construction, Public health, Legislation.
Identifiers: *FWPCA Amendments of 1972, Environmental emergency fund, Hazardous substances(Pollution).

The recent markup for HR 9560, a bill to amend the Water Pollution Control Act Amendments of 1972 deals with numerous categories of recommended changes. It suggested that general authorizations to the Environmental Protection Agency (EPA) be extended. It also recommended that the federal share of planning costs be reduced from 100% federal financing to 75%. The responsibility for processing grant application should be decentralized in order to reduce duplication of federal-state activities and improved efficiency. This proposal would grant states the money to carry out certification programs. The EPA would be permitted to extend the 1977 deadline on a case-by-case basis up to July 1, 1982. Several proposed amendments would create stiffer civil penalties for discharge of hazardous materials. Additional amendments deal with funding for existing wastewater systems, new allocation formulas to be used in distributing construction grant funds, federal loan guarantees to states having difficulty obtaining commercial financing, allowing state to determine their own priorities in treatment construction projects, and authorization of a $5 million dollar environmental emergency fund for situations that present imminent damages to public health or welfare. (V.C. Rieck-Florida)
W77-07236

NCWQ RECOMMENDS CHANGES IN WATER POLLUTION ACT,
P. S. Ward.
Journal Water Pollution Control Federation, Vol. 48, No. 4, p. 622-27 (April 1976).

Descriptors: *Water quality standards, *Water requirements, Permits, Grants, Monitoring, Water quality control, Pollution, Discharge(Water), Administrative decisions, Construction, Construction costs, Conservation, Resources, State governments, Federal government, Planning, Administration, Irrigation programs.
Identifiers: *National Commission on Water Quality(NCWQ), *Federal Water Pollution Control Act(FWPCA) Amendments of 1972, Irrigated agriculture.

The National Commission on Water Quality recently made recommendations aimed at reaching the ambitious objectives of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. The recommendations were in six major area. (1) Congress should extend the time to meet the 1977 requirements on a case-by-case basis for dischargers where good cause exists. (2) The 'swimmability, fishability' goal should be retained, but the date of achievement of the 1983 requirements should be postponed. (3) Under certain provisions, Congress should certify states to exercise full authority and responsibility for planning and aministration of permit and grant programs.

(4) The construction grant program should be funded between $5 billion and $10 billion per year at 75% of the cost of construction. (5) The goal of elimination of discharge of pollutants should be redefined to stress conservation and reuse of resources. (6) There should be flexibility in the irriated agriculture category with discretionary authority to exempt certain dischargers from monitoring and permit requirements. It has not yet been determined whether the Commission's report will change any minds. However, it has gained the attention of many experts. (Rieck-Florida)
W77-07237

THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 AS APPLIED TO THE SURFACE MINE IN WEST VIRGINIA - POLLUTANT DISCHARGE PERMIT REQUIREMENTS,
L. W. Marquess.
West Virginia Law Review, Vol. 78, p. 213-29 (1976).

Descriptors: *West Virginia, *Federal Water Pollution Control Act, *Coal mine wastes, *Strip mine wastes, Water pollution sources, Wastes, Mining, Coal mines, Legal aspects, Permits, Discharge(Water), Mine wastes, Industrial wastes, Water quality, Water pollution, Streams.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *National Pollutant Discharge Elimination System(NPDES).

The policy of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972 provides the impetus for the prevention of the destruction of one of West Virginia's greatest natural resources, its clean mountain streams. The heart of the FWPCA insofar as it attempts to control and eventually eliminate the discharge of pollutants into the nation's waters is the National Pollutant Discharge Elimination System (NPDES) permit program. The conditions imposed on mine owners by the permit program have increased the difficulty of opening and operating a surface mine in West Virginia. The sections of the act which are pertinent to surface mines are discussed. The sections which apply to West Virginia surface mines in particular are explained. The article also provides a guide to the procedure by which the surface mine operator may obtain a discharge permit. Specific technical requirements may vary from mine to mine. Finally, the legal ramifications of noncompliance with the requirements of the act are examined in terms of government action, both criminal and civil, and of citizens' actions for civil remedies. (Rieck-Florida)
W77-07240

RESEARCH AND THE QUEST FOR CLEAN WATER,
Water Pollution Control Federation, Washington, D.C. Board of Control Research Committee.
Journal Water Pollution Control Federation, Vol. 47, No. 2, p. 240-51 (1975).

Descriptors: *Water Pollution Control Federation, Research priorities, *Decision making, *Federal Water Pollution Control Act of 1972, Analytical techniques, Water pollution control, Research and development, Monitoring, Environmental effects, Waste water treatment, Management, Legal aspects, Economics, Social needs, Systems analysis, Ethics, Aesthetics, Public health.
Identifiers: Residual disposal.

Available technological and analytical tools are unable to cope with water pollution control challenges set forth in the Federal Water Pollution Control Act (FWPCA) of 1972. The Water Pollution Control Federation (WPCF) is concerned over the current, inadequate federal effort in the area of research. The WPCF Board of Control considered four categories of research needs: (1) analytical techniques with more complete and accurate monitoring systems of information concerning the chemical, biological and physical characteristics of water; (2) wastewater treatment with a consideration of the entire treatment sequence of collection, treatment and residual disposal in municipal and industrial systems; (3) environmental effects concerning ecological, aesthetic and public health effects; and (4) management strategies with major research need for policy modeling to understand links between technology and microeconomic aspects in conjunction with social and ethical considerations. Water pollution control, as a public policy problem, is a proper area for research in law, economics, sociology, systems analysis and other disciplines related to decision making. (Rieck-Florida)
W77-07243

THE 1973 IMCO CONVENTION: TIGHTENING THE CONTROLS ON OPERATIONAL OIL POLLUTION FROM TANKERS,
R. J. Skocypec.
UCLA-Alaska Law Review, Vol 5, No 2, p 353-80, (1976).

Descriptors: *Oil pollution, *Oil wastes, *Oil spills, *Ships, Water pollution sources, Oil, Petroleum, International waters, Oily water, Chemical wastes, Fuels, Oil industry, Water pollution, International law, Treaties, Legal aspects, International commissions, Federal government, Conferences, Foreign countries, Governments, United Nations.
Identifiers: *International Conference on Marine Pollution, *Oil Pollution Act, Coastal waters, Contiguous zone, Territorial seas(Jurisdiction), Coastal zone management.

In 1973 the International conference on Marine Pollution proposed a new and more stringent set of regulations to control oil pollution from tankers. The new convertion deals primarily with 'intentional', or operational, oil pollution sources. Pertinent provisions from the new regulations include the expanded definition of 'oil' to include petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products. Dischrge standards are strengthened to prevent any discharge within 50 nautical miles of land, and the rate of discharge must not exceed 60 liters per nautical mile. New tankers may not discharge more than 1/30,000 of their previous cargo. A new discharge monitoring and control system will be reguired on all tankers to detech violations. Shoreside treatment facilities will become mandatory in order to reduce the necessity of discharging at sea. Additionally any new tanker exceeding 70,000 DWT will be required to have a segregated ballast tanker, thereby eliminating dirty ballast entirely. The major drawback of the new regulations is in enforcement. Coastal nations can only take action against violations within their twelve mile jurisdictional limits. Violations committed on the high seas must be dealth with by the flag state. Experience has proved this ineffective. (Moorhouse-Florida)
W77-07244

THERMAL POLLUTION AND ITS CONTROL,
Washington Univ., St. Louis, Mo. Dept. of Chemical Engineering; and Washington Univ., St. Louis, Mo. Program in Technology and Human Affairs.
C. T. Hill.
Environmental Affairs, Vol. 2, No. 2, p. 406-20 (Fall 1972). 2 tab.

Descriptors: *Cooling, *Thermal pollution, *Heat, *Cooling tower, Powerplants, Electric power, Technology, Cooling water, Water pollution, Heated water, Water temperature, Water cooling, Thermal properties, Reasonable use, Temperature, Heat transfer, Heat flow, Environment, Waste water(Pollution), Heat treatment, Electric powerplants.
Identifiers: *Cooling ponds.

Thermal pollution is waste heat released to the environment as a by-product of the generation of electricity in steam power plants. Rapid growth of electric power generation and increasing size of individual power plants will cause the national average heat rate to expand in the future. Adequate and reliable technology for thermal pollution control currently exists. Cooling towers or cooling ponds can be used to transfer waste heat to the atmosphere. Because of the large amount of land reguired for cooling ponds, their use is restricted to regions where land is both available and cheap. Loss of water by evaporation and drift, discharge of treatment chemicals and adverse effects of moist heated air plumes are major environmental problems connected with wet cooling towers. The author presents suggestions for the beneficial utilization of waste heat. However, most of the ideas are still in the planning stage. Furthermore, even if employed for beneficial purposes, all heat is eventually released. A limit will be reached on overall thermal discharge due to global heating. Therefore, the ultimate problem of a limit to global thermal discharge cannot be avoided by using waste heat beneficially. (Rieck-Florida)
W77-07245

RULES FOR THE PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN BULK,
Coast Guard, Washington, D.C.
Federal Register, Vol 41, No 240, p 54177-80, December 13, 1976.

Descriptors: *Regulation, *Coast Guard regulations, *Oil industry, *Oil wastes, Oil pollution, Waste water(Pollution), Legal aspects, Federal government, Oily water, Ships, Control, Governments, Inspection, Law enforcement, Foreign trade, Foreign countries.
Identifiers: *Coastal waters, Territorial seas(Jurisdiction), Administrative regulations, Marine environment.

Amendments have been added to the oil vessel pollution regulations imposing design, equipment and operation requirements for seagoing U.S. flag tank vessels of 150 gross tons or more and equally heavy foreign flag vessels that enter U.S. navigable waters. Slop tanks must have a slop retention capacity of three percent of the vessel's oil carrying capacity. A two percent capacity is allowed under limited circumstances. Before a vessel enters U. S. waters the owner, builder or designer must submit calculations to substantiate compliance with the tank size requirements. The required calculations are explictly delineated in the regulations. The amendments also provide the conditions under which clean and segregated ballast may be discharged. The amendments become effective April 1, 1977. Sections 157.11, 157.15, 157.17(a), (b) and 157.19(a)(2), (a)(3) become effective at different times depending on varying characteristics of the vessel concerned. (Moorhouse-Florida)
W77-07251

GUIDELINES ESTABLISHING TEST PROCEDURES FOR THE ANALYSIS OF POLLUTANTS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5A.
W77-07252

RULES AND REGULATIONS FOR PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN DOMESTIC TRADE,
Coast Guard, Washington, D.C.
Federal Register, Vol 41, No 5, p 1479-82, January 8, 1976.

Descriptors: *Coast Guard regulations, *Oil pollution, *International waters, *Oil spills, Storage tanks, Oily water, Disasters, Water pollution sources, Transportation, Boats, Federal government, Ships, International commissions, Oil-water interfaces, Oceans, Pollutants.
Identifiers: *Hazardous substances(Pollution), Tankers, Vessels, Ballast tanks.

Coast Guard regulations provide for the placement of ballast tanks on oil-carrying vessels of over 70,000 DWT in order to minimize oil loss incase of accidental leakage from tankers. When accidental penetration of the side or bottom of a tanker occurs, side penetrations are both more likely to result, and more apt to release all the contents of the ruptured tank. The higher degree of built-up protection possible through insulating the tanks from the hull with ballast storage tanks is utilized within the parameters of maintaining longitudinal stress, draft and trim requirements. Additionally, the presence of ballast tanks will make unnecessary the practice of putting ballast water in the oil tanks when they are empty; the release of this oily water sludge is a major source of water pollution in itself. While there is some belief that the cost of segregated balance is too great, the Coast Guard believes that segregated ballast is needed as a measure to improve the environmental quality of the oceans. (Molloy-Florida)
W77-07254

A SCIENTIFIC AND LEGAL LOOK AT THERMAL POLLUTION,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07256

FLORIDA STATUTES, CHAPTER 253--THE 1969 AMENDMENTS AND PROPOSED LEGISLATION,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07258

ECONOMIC ASPECTS OF POLLUTION ABATEMENT, PART 1,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07260

LEGAL ASPECTS OF CHANGES BROUGHT ABOUT BY BUCKEYE'S POLLUTION ABATEMENT PROGRAM, PART II,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-07261

PECOS RIVER COMPACT.
For primary bibliographic entry see Field 6E.
W77-07262

APPROPRIATION OF WATER--PERMITS, CERTIFICATES AND LICENSES--SURVEY.
For primary bibliographic entry see Field 6E.
W77-07265

UNITED STATES V ASHLAND OIL AND TRANSPORTATION COMPANY (USE OF THE WORD 'NAVIGABLE WATERS' IN THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 HELD TO MEAN 'WATERS OF THE UNITED STATES').
For primary bibliographic entry see Field 6E.
W77-07273

UNITED STATES V CUTTER LABORATORIES, INC (CIVIL LIABILITY OF A PERMITTEE FOR WHOM NO INDUSTRIAL EFFLUENT LIMITATIONS OR GUIDELINES EXIST).
For primary bibliographic entry see Field 6E.
W77-07274

UNITED STATES V DIAMOND (PERMANENT INJUNCTION DURING ADMINISTRATIVE PROCEDURES JUSTIFIED BY DEVELOPERS FILL OF MARSHLAND WITHOUT REFUSE ACT PERMIT),
For primary bibliographic entry see Field 6E.
W77-07275

COMMITTEE FOR THE CONSIDERATION OF THE JONES FALLS SEWAGE SYSTEM V TRAIN (FEDERAL COMMON LAW CONCERNING WATER POLLUTION APPLICIABLE TO INTERSTATE CONTROVERSEY ONLY),
For primary bibliographic entry see Field 6E.
W77-07276

GEOLOGISTS CLAIM HEALTH CAN BE TRACED TO ROCKS,
For primary bibliographic entry see Field 5B.
W77-07290

DEEP WELL INJECTION: SWEEPING THE PROBLEM UNDER THE CARPET,
P. J. Kendrick.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 187-189, February, 1977.

Descriptors: *Injection wells, *Waste disposal, Aquifers, Legislation, Water pollution control, Pollution abatement, Deep wells.
Identifiers: Safe Drinking Water Act.

Although deep well injection as a means of waste disposal is thought to be feasible for some areas of the country, it remains a little-understood practice. Introducing toxic materials into confined geologic strata having no other potential use may pose threats to future drinking water sources, mining operations and the subsurface environment in general. Not only would decontamination be impossible to effect, but possible geologic changes resulting from high-pressure injection such as fracturing of strata and the triggering of seismic activity would also have irreversible consequences. State legislation to regulate subsurface injection has existed as early as 1934; federal interest in injection well control began in 1970, culminating with the Safe Drinking Water Act of 1974 and its accompanying inspection, monitoring, record-keeping and reporting regulations now being finalized by the EPA. In the past, legal proceedings concerning well injection have dealt with the issue from various standpoints and with rather confusing results. Current interpretation frequently hinges upon nuisance or strict liability doctrine. (Eberle-NWWA)
W77-07295

FIRE EFFECTS ON WATER SUPPLY, FLOODS, AND SEDIMENTATION,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
For primary bibliographic entry see Field 4C.
W77-07318

STATUS REPORT ON ABATEMENT OF WATER POLLUTION FROM THE CANADIAN PETROLEUM REFINING INDUSTRY - 1975,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Economic and Technical Review Report, EPS 3-WP-76-11, December, 1976, 54 p., 5 fig., 6 tab, 2 append.

Descriptors: *Oil wastes, *Oil industry, Water pollution control, Regulation, Effluents, Toxicity, Chemical wastes, Discharge measurement, *Canada, Oil wastes, Oil pollution, Oily water, Costs, Phenols, Sulphides, Ammonia, Suspended solids, *Water quality standards, Waste disposal, *Pollution abatement.
Identifiers: *Refineries.

Effluent regulations and guidelines to limit the discharge of pollutants from the petroleum refining industry were issued under the Federal Fisheries Act in November 1973. This report presents an asessment of the progress to the end of 1975 in meeting the discharge objectives, and provides projections of the anticipated status through to 1980. (WATDOC)
W77-07334

OCCURRENCE AND DETERMINATION OF A HERBICIDE BENTHIOCARB IN RIVERS AND AGRICULTURAL DRAINAGES,
Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
For primary bibliographic entry see Field 5A.
W77-07361

SPILLWAY REDESIGN ABATES GAS SUPERSATURATION IN COLUMBIA RIVER,
Army Engineer District, Portland, Oreg., North Pacific Div.
H. A. Smith, Jr.
Civil Engineering, ASCE, Vol. 44 (9), p. 70-73, September 1974, 4 fig.

Descriptors: *Columbia River, *Supersaturation, Anadromous fish, *Dams, Dam sites, Spillways, *Engineering structures, *Salmon, Hydraulics, Fish passage, Fish migration, Nitrogen, Mortalities.
Identifiers: *Gas bubble disease, *Spillway deflectors, Nitrogen supersaturation, *Fish transport, Fish trucking.

The Corps of Engineers and other agencies are exploring several possible solutions to the gas supersaturation problem. These include more headwater storage, installation of additional power units to reduce the amount of spilling, new spillway stilling basin designs and collection and transportation around the supersaturated stretches of Columbia and Snake River Basins. Spillway deflectors seem to be the most promising solution. (Katz)
W77-07432

REPORT OF A STUDY OF CONTROL AGENCY REVENUE FEES,
Environmental Protection Agency, Washington, D. C. Office of Planning and, Management.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 668, Price codes: A04 in paper copy, A01 in microfiche. July 1974. 65 p. 5 tab.

Descriptors: *Governmental interrelations, Federal government, *Local governments, *State governments, *Government supports, Pollution taxes(Charges, *Income, Grants, Water pollution control, Air pollution, Pollutant identification, Government finance.
Identifiers: Fees, *Pollution control agency grants.

Revenues potentially available to state and local governments from fees charged in permitting, inspecting, monitoring, or otherwise regulating air and water pollution are studied to indicate the possibility and problems associated with their use as a replacement for federal control agency grants. An estimate of the nationwide revenue potential showed that as much as 30% of the funding required by stat and local control agencies could be derived from fees. However, during FY 1974, fee receipts amounted to only 3% of the estimated $240 million expenditure. The largest obstacle to be overcome was shown to be the generally negative attitude of state and local officials. Implications are that; (1) States and localities will not take over federal responsibilities nor support a variety of federally required activities if the federal government does not pay its fair share, (2) a shift from the grant program toward fees would be seen as a shift in federal commitment from the current

federal/state partnership arrangement, and (3) most state and local governments would not turn to fees in the event of a grant phase-out, and reductions in federal funding would only slowly be made up by increased state and local appropriations. It was recommended that the current grant programs be continued and that no formal encouragement of fees be undertaken. (Luedtke-Wisconsin).
W77-07435

LEGAL DECISIONS AND OPINIONS IN POLLUTION CASES,
Messenger, Lynch, Hills and Miller, Beltsville, Md.
J. P. Hills.
Environmental Science and Technology, Vol. 10, No. 3, p. 234-238, 1976.

Descriptors: *Water pollution, *Air pollution, *Legal aspects, *Judicial decisions, *Risks, *Court decisions, Common law, Legal review, Negligence, Public health, Regulation, Cases, Water law, Asbestos, Water pollution sources, Lake Superior, Lead, Toxicity, Pollutants, Aldrin, Pesticides, Dieldrin.
Identifiers: *Burden of Proof(Legal), Polyvinyl chloride.

A study of legal trends in connection with court decisions based on litigation related to water and air pollution finds that in cases dealing with frontier areas of scientific knowledge, U.S. courts are waiving traditional burdens of proof, giving increased weight to expert opinions and/or lowering their standard of necessary proof. The law has traditionally dealt with a single plaintiff who sues a defendant was more likely than not responsible for the injury. It has traditionally required a showing that the defendant was more likely than not responsible for the injury. In pollution cases, however, and especially in those that relate to public health, large numbers of persons stand to be injured if the cited activity is not stopped. This is where the reciprocal relationship between risk and harm becomes important in legal remedies. Four typical cases are reviewed: (1)the Reserve Mining Company (Lake Superior) area) litigation over asbestos pollution in drinking water sources; (2) lead in gasoline; (3) the manufacture and use of polyvinyl chloride products; and (4) the Environmental Protection Agency ban on the pesticide aldrin/dieldrin. An ordinal scale is given in the text which relates measure of proof (in 10% increments) to purposes for which the proof was used by courts. According to the scale, courts are now permitting administrative determinations in pollution-related cases where as little as 27% certainty is sufficient to initiate certain kinds of actions. (Harris-Wisconsin).
W77-07436

THE ECONOMICS OF NATURAL ENVIRONMENTS, STUDIES IN THE VALUATION OF COMMODITY AND AMENITY RESOURCES.
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-07437

THE ENVIRONMENTALLY CONCERNED CITIZEN: SOME CORRELATES,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 6G.
W77-07438

PREDICTING THE IMPACTS OF PHOSPHORUS MANAGEMENT POLICIES ON THE EUTROPHICATION OF SKAHA LAKE, BRITISH COLUMBIA, CANADA,
For primary bibliographic entry see Field 5C.
W77-07446

LAKE RESTORATION THROUGH MECHANICAL HARVESTING OF AQUATIC VEGETATION,
I. Wile.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part I, p. 660-671, 1975. 7 fig., 3 tab., 11 ref.

Descriptors: *Lakes, *Reclamation, *Harvesting, Mechanical control, Economics, Waste disposal, Aquatic plants, *Canada, Weeds, *Aquatic weed control.
Identifiers: *Lake restoration, Southern Chemung Lake(Ontario), *Kawartha Lakes(Ontario).

As a potential corrective measure, mechanical harvesting of nuisance vegetation is being evaluated on a pilot-scale basis in Southern Chemung Lake, one of the more seriously-afflicted lakes in the Kawartha Lakes area of Ontario, Canada. Detailed studies are currently underway to assess the impact of extensive plant removal on water quality, macrophyte and phytoplankton dynamics and on fisheries. Although no major conclusions regarding the practical and biological implications of weed harvesting can be reached on the basis of a single year's data, initial results are encouraging. To date no significant changes have been noted in fish and algal populations. Due to the late start in operations, the extent of plant regrowth in areas which were harvested was not properly assessed. While the use of mechanical harvesting as a management technique holds considerable promise, many problems remain unsolved. The low operating speeds of existent machinery coupled with continuous breakdowns resulted in a harvesting rate of 0.27 hectares per hour, a most unproductive rate when compared with agricultural operations. A secondary problem relates to the disposal of large quantities of plant material generated by the harvesting operation. Although nearby farm disposal sites were provided, the economics of weed harvesting could be considerably improved if harvested material could be profitably utilized. (Harrison-Wisconsin)
W77-07451

INFLUENCE OF THE DRAINAGE BASIN ON THE EUTROPHICATION OF THE A-MESOTROPHIC LAKE PIASECZNO AND DISEUTROPHICATION OF THE POND LAKE BIKCZE,
Instytut Przyrodniczych Podstaw, Lublin (Poland). Produkeji Roslinnej AR.
For primary bibliographic entry see Field 5C.
W77-07452

APPLICATION OF VASCULAR AQUATIC PLANTS FOR POLLUTION REMOVAL, ENERGY AND FOOD PRODUCTION IN A BIOLOGICAL SYSTEM,
National Space Technology Labs., Bay St. Louis, Miss.
For primary bibliographic entry see Field 5D.
W77-07474

HYDROLOGY,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-07494

WIND CONTROL OF ALGAE GROWTH IN EUTROPHIC LAKES,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
H. Stefan, T. Skoglund, and R. O. Megard.
Journal of the Environmental Engineering Div., Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE6, p. 1201-1213, 1976. 7 fig., 15 ref.

Descriptors: *Mechanical control, *Algal control, Wind velocity, *Eutrophication, Mathematical models, Light penetration, Water temperature, Epilimnion, Mixing, Euphotic zone, Lakes.
Identifiers: Air bubbling, Wind control(Algal growth).

While nutrient levels, grazing, and other processes are important to algae biomass, the contention is that because algal growth is confined to the photic zone, wind induced dynamics of the mixed layer in a medium-sized eutrophic lake will catalytically control the actual primary productivity. This theory is explained and mathematically defined by analysis of a water column's equilibrium concentrations as a function of the light attenuation coefficient and depth. For a real, lake, the phytoplankton growth was computed on a daily basis throughout a season as a function of daily variations in water temperature distributions, mixed layer depths, and illumination, each calculated separately, and used as input for the phytoplankton growth analysis. The computations indicated that periods of warm, calm weather result in higher near surface water temperature and smaller mixed layer depths and are usually accompanied or followed within a few days by strong increases in epilimnetic phytoplankton concentrations. Populations were found to decrease due to increased shading when mixed layer depths increased. Artificial algal control by air bubbling can thus control phytoplankton growth by varying the mixed layer depth. The analytical method presented can be used to evaluate the effectiveness of changes in the mixed layer depth in a lake as a green and blue-green algae control method. (Auen-Wisconsin).
W77-07497

WATER QUALITY CRITERIA AND WASTE WATER TREATMENT,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5D.
W77-07522

ECONOMIC VALUE OF LOW FLOW DATA,
Technical Univ. of Denmark, Copenhagen.
For primary bibliographic entry see Field 5D.
W77-07537

POWER PLANT SITE EVALUATION: THE CASE OF THE SHARON PLANT IN ISRAEL,
Technion - Israel Inst. of Tech., Haifa. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6G.
W77-07546

WATER QUALITY AND AQUITARD PERMEABILITY,
Idaho Univ., Moscow. Dept. of Civil Engineering.
J. H. Hardcastle, and J. K. Mitchell.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings paper No. 12203, p 205-220, June 1976. 8 fig, 1 tab, 15 ref.

Descriptors: *Water quality, *Absorption, *Aquitards, *Clays, *Drainage, *Groundwater, *Permeability, *Saline water intrusion, *Sodium, Dispersion, Aquifers, Electrolytes, Dissolved solids, Groundwater recharge, Leaching, Illite, Silts, Salinity, *Sediments, Soils.

Flow tests on artificially sedimented illite-silt mixtures designed to simulate aquitard soils show that permeability changes accompanying changes in pore water dissolved salt concentration depend upon the exchangeable sodium percentage and the structural state of the clay. The dissolved salt concentration at which clay swelling causes permeability reductions and the concentration that causes clay dispersion both vary directly with exchangeable sodium percentage. Comparisons suggest that at equal exchangeable sodium percentages, flocculated-disaggregated illite particles swell more and

disperse at slightly higher dissolved salt concentrations than when the particles have been previously aggregated into domains by drying. Permeability increases accompanying increases in dissolved salt concentrations are small. When the clay is not dispersed, permeability increases are proportional to the degree of clay swelling existing prior to the increase. Permeability increases in completely dispersed clays are inversely related to exchangeable sodium percentage. (Bell-Cornell)
W77-07551

SUBJECT KEYWORD LIST, (ESTUARINE AND COASTAL MARINE SCIENCE),
For primary bibliographic entry see Field 2L.
W77-07564

RELATION BETWEEN THE AMOUNTS OF FERTILIZATION AND LIVESTOCK WASTE ON FIELDS AND THE POLLUTION OF STREAMS FLOWING INTO LAKE KASUMIGAURA: 1. ON THE RELATION BETWEEN THE AMOUNT OF FERTILIZER APPLICATION AND THE SPECIFIC POLLUTION LOADS OF NITROGEN AND PHOSPHORUS IN MAIN STREAMS FLOWING INTO LAKE NISHIURA, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07568

RELATION BETWEEN THE AMOUNTS OF FERTILIZER AND LIVESTOCK WASTE ON FIELDS AND THE POLLUTION OF STREAMS FLOWING INTO LAKE KASUMIGAURA: II. ON THE RELATION BETWEEN LIVESTOCK WASTE PER UNIT AREA OF BASIN AND THE SPECIFIC LOAD OF POLLUTANTS IN MAIN STREAMS FLOWING INTO NISHIURA LAKE BASIN, (IN JAPANESE),
Ibaraki Univ. Mito (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W77-07569

LAKE RESTORATION BY BOTTOM WATER SIPHONING, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland).
R. Gaechter.
Schweiz Z Hydrol 38(1), p 1-28, 1976.

Descriptors: Siphons, *Eutrophication, Lakes, Nutrients, Drainage, Trophic levels, Water pollution control, *Pollution abatement, *Hypolimnion.
Identifiers: *Lake restoration, *Siphoning(Bottom water).

It is possible to restore a highly eutrophic lake by the mean of bottom water siphoning. The main effects of the hypolimnion drainage, e.g., erosion of the hypolimnion and increase of the nutrient export out of the lake are discussed. From mass balance calculations it is deduced that in eutrophic shallow lakes the nutrient supply to the trophogenic layer by the sediments can temporarily exceed the external loading by more than a hundredfold. The process of self-maintaining autoeutrophication is described. --Copyright 1977, Biological Abstracts, Inc.
W77-07577

MACROPHYTES AND PHOSPHORUS IN LAKE ANDSJON, CENTRAL SWEDEN, (IN SWEDISH),
For primary bibliographic entry see Field 5C.
W77-07582

OUTBREAK OF CHIRONOMID MIDGE IN A POLLUTED RIVER AND THE CHEMICAL CONTROL OF THE LARVAE, (IN JAPANESE),
Kagoshima Univ. (Japan). Dept. of Medical Zoology.
Y. Tabaru.
Jpn J Sanit Zool 26(4), p 247-252, 1975.

Descriptors: *Chemcontrol, Carp, *Diptera, Larvae, Water pollution, Rivers, *Midges, Aquatic insects, *Insecticides, Pollution abatement.
Identifiers: *Temephos, *Suimon River(Japan).

Investigations on the chemical control of chironomid larvae were carried out in the Suimon river which runs through the center of Ohgaki City, Gifu Prefecture (Japan). The river was so heavily polluted due to drainage from the factories that no midge larvae could breed there before the Water Pollution Control Law was enforced in 1971. The midge-swarm problems arose in autumn 1973, because of the enforcement of regulation of the drainage from the factories which improved the biological oxygen demand in the water from 85 ppm in 1970 to 12 ppm in 1974. The density of the larvae per 40 cu cm (20 sq cm x 2 cm in depth) of the bottom mud was estimated from 126 to 186 before the river was treated with temephos. In the laboratory test, 45% of the tested larvae were killed and the survivals were intoxicated at 12 h after treatment when they were dipped into 0.8 ppm active ingredient (AI) of temephos WP (wettable powder) for 60 min. In the field test, the river was treated with the temephos WP for 60 min at 1 ppm of the flowing water volume. At 9 days after treatment, no midge larvae were found at about 1.6 km downstream from the application spot. Temephos showed no poisonous effects on a loach up to 10 ppm in the laboratory test. A loach, carp, crucion and top minnow habitating the river were not affected by the temephos treatment.--Copyright 1977, Biological Abstracts, Inc.
W77-07585

LITERATURE ON ENVIRONMENTAL PROTECTION, MANAGEMENT AND HYGIENE IN SWEDEN 1952-1971: BIBLIOGRAPHY AND ANALYSIS, (IN SWEDISH),
For primary bibliographic entry see Field 6G.
W77-07586

HYGIENIC STANDARDIZATION OF DISODIUM SALTS OF META-AND PARA-DIISOPROPYLBENZENE IN WATER BODIES, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR). Div. of Public Hygiene.
For primary bibliographic entry see Field 5C.
W77-07590

ASSAY OF DETERGENT RESIDUES IN FRESH WATER, SEA WATER AND WASTE WATERS: METHOD OF EXTRACTION AND CONCENTRATION OF SURFACTANTS BY ADSORPTION ON LIQUID-LIQUID INTERFACE, (IN FRENCH),
Tours Univ. (France). Laboratoire de Chimie Minerale et d'Hydrologie.
For primary bibliographic entry see Field 5A.
W77-07591

SELF-PURIFICATION IN THE COASTAL WATERS OF THE BLACK SEA, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-07592

BACTERIOLOGICAL QUALITY OF POULTRY-FARMS' WATER IN MINAS GERAIS STATE, BRAZIL: 1973, (IN PORTUGESE),
Universidade Federal de Minas Gerais, Belo Horizonte (Brazil). School of Veterinary Medicine.
For primary bibliographic entry see Field 5F.
W77-07594

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE EVALUATION OF SIMPLE AND OPTIMAL DECISION RULES WITH MISSPECIFIED WELFARE FUNCTIONS,
Australian National Univ., Canberra. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W77-07439

EVALUATION OF FLOOD FORECASTING-RESPONSE SYSTEMS,
Princeton Univ., N.J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07524

PUMPED STORAGE OPTIMIZATION IN GENERATION SYSTEMS,
Natal Univ., Durban(South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07525

VALUE OF LANDSAT IN URBAN WATER RESOURCES PLANNING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
T. J. Jackson, and R. M. Ragan.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12906, p 33-46, May 1977. 5 fig, 3 tab, 20 ref.

Descriptors: *Water resources, *Planning, *Decision making, *Watersheds(Basins), *Economic efficiency, *Remote sensing, Hydraulics, Hydrology, Hydrologic data, Economics, Value, Simulation analysis, Optimization, Flood frequency, Flood control, Flood damage, Equations, Mathematical models, Systems analysis, Probability, Risks, Virginia.
Identifiers: *Urban areas, *Economic analysis, *Bayesian decision theory, Information theory, Opportunity loss matrix, Cost-effectiveness, Benefit maximization, *Fourmile Run watershed(Va), *Landsat data.

Bayesian decision theory was used to study the economic value of Landsat data in urban water resources planning. The investigation focused upon a case study of the Fourmile Run watershed in the Virginia suburbs of Washington, D. C. Land cover data were required to aid in the selection of an optimal level of onsite detention storage to mitigate flood damages. The problem was to determine the level of flood control that maximized the difference between annual benefit and annual cost, the difference being the annual net benefit which was used in calculating the opportunity losses. An estimate of the percentage of impervious area was needed to determine theparameters of the hydrologic simulation model utilized in generating the flood frequency information. Preposterior Bayesian analysis indicated that computer-aided analysis of Landsat data was a highly cost-effective method for determining the percentage of impervious area.(See also W77-07528), (Bell-Cornell)
W77-07527

TEST OF LANDSAT-BASED URBAN HYDROLOGIC MODELING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
T. J. Jackson, R. M. Ragan, and W. N. Fitch.
Journal of the Water Resources Planning and Management Division, Proceedings of the Amer-

ican Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12950, May 1977, p 141-158. 8 fig, 6 tab, 18 ref.

Descriptors: *Watersheds(Basins), *Areial photography, *Computer models, *Remote sensing, Hydraulics, Hydrology, Water resources, Systems analysis, Planning.
Identifiers: Urban planning, Urban development, Cost-effectiveness.

Many of the models designed to support the hydrologic studies associated with urban water resources planning require input parameters that are defined in terms of land cover. Estimating the land cover is a difficult and expensive task and any innovation that can reduce these problems should be of significant value to the water resources planning community. The purpose of the reported investigation was to compare conventional and Landsat-based methods for determining the land cover inputs of hydrologic planning and design models. Comparisons were based on a case study of the Fourmile Run Watershed in Virginia. Results of the study indicated that for planning model studies, the Landsat-based approach is highly cost-effective. However, in the design model investigations, the errors encountered when the Landsat data are used were unacceptable. (See also W77-07527) (Bell-Cornell)
W77-07528

MANAGEMENT MODEL FOR GROUND WATER DEVELOPMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-07529

MODELING MULTIPLE-USE IN NATURAL AREAS: PART I -- THE BASIC FORMULATION,
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
D. W. York, B. C. Dysart, III, and L. W. Gahan.
Water Resources Bulletin, Vol. 13, No. 1, p 13-24, February 1977. 3 fig, 1 tab, 14 ref.

Descriptors: *Environment, *Assessment, *Cost-benefit analysis, *Optimization, Water resources, Planning, Economics, Constraints, Mathematical models, Systems analysis, Recreation.
Identifiers: *Natural areas, *Multiple use, *Environmental planning, Compatibility constraints.

Presented is a mathematical model of multiple-use in natural areas. The model represents a unified system for the assessment of cases where some form of development is proposed for relatively natural areas. The focus of the model system is a cost-benefit analysis. Provisions for the full consideration of easily measured monetary costs and benefits as well as semitangible benefits accruing from environment-related activities such as outdoor recreation are contained in the model. Means for incorporating desirability as a measure of aesthetics, uniqueness, and environmental quality into the evaluation are provided. Several types of constraints have been imposed on the system to increase model realism. A family of compatibility constraints has been designed to limit inter-use conflicts arising from incompatible activities. A form of the gradient optimization algorithm is utilized to facilitate the evaluation. The decision making process involves the selection of the management scheme that maximizes total net benefits accruing within the area of economic influence. The model system has application in a wide range of problems frequently encountered in environmental planning and assessment as well as in natural resources management. (Bell-Cornell)
W77-07530

GAINS FROM JOINT OPERATION OF MULTIPLE RESERVOIR SYSTEMS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-07533

THE ECONOMIC BASIS OF RESOURCE INFORMATION SYSTEMS: THE CASE OF STREAMFLOW DATA NETWORK DESIGN,
Geological Survey, Reston, Va. Geologic Div.
For primary bibliographic entry see Field 7A.
W77-07534

RELIABILITY-CONSTRAINED DYNAMIC PROGRAMING AND RANDOMIZED RELEASE RULES IN RESERVOIR MANAGEMENT,
Worcester Polytechnic Inst., Mass. Dept. Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07535

RESERVOIR OPERATION UNDER CONFLICTING OBJECTIVES,
Politecnico di Milano (Italy). Instituto di Elettrotecnica ed Elettronica.
For primary bibliographic entry see Field 4A.
W77-07536

ECONOMIC VALUE OF LOW FLOW DATA,
Technical Univ. of Denmark, Copenhagen.
For primary bibliographic entry see Field 5D.
W77-07537

CAPACITY EXPANSION AND OPERATIONAL PLANNING FOR REGIONAL WATER-RESOURCE SYSTEMS,
General Motors Corp., Cleveland, Ohio. Fisher Body.
For primary bibliographic entry see Field 6B.
W77-07538

SCHEDULING MODELS FOR WILDERNESS RECREATION.
Utah State Univ., Logan. Dept. of Forest Science.
For primary bibliographic entry see Field 6B.
W77-07541

DECISION-MAKING FOR ENVIRONMENTAL RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W77-07542

TOWARDS SYSTEM MODELS FOR WATER RESOURCE MANAGEMENT,
Leeds Univ. (England). Dept. of Geography.
A. G. Wilson.
Journal of Environmental Management, Vol. 1, No. 1, p 65-81, January 1973. 2 fig, 14 ref, append.

Descriptors: Water resources development, *Management, *Model studies, *Planning, Linear programming, Optimization, Economic feasibility, Costs, Equations, Systems analysis.
Identifiers: *System models, *Model building, *Spatial analysis techniques, Cost minimization, Benefit maximization, Nonlinear programming.

Explored are some of the problems associated with the task of building system models which would help in water resource management. Examined are the kinds of progress in management which would be expected if some of these problems could be solved. The main conclusion drawn is that there is every reason why fairly rapid development should be possible in improvements in water resource management using model based spatial analysis skills, and it is expected that geographers will need to play a leading role in such developments, in association with a variety of skills from other disciplines. First, a water resources system is defined along with characterization of the system state. This provides a basic framework within which different types of model could be developed for different purposes and scales of analysis. Next, the nature of management objectives for the system is discussed; associated decision areas are considered. The system is characterized by source variables, delivery variables, and sink variables. Considered are cost minimization and benefit maximization. Next, the nature of possible models is explored. An example cost minimization problem, formulated using both linear and nonlinear programming, is presented to illustrate model use. Finally, how the models can be used to achieve management objectives is explored, and the possibility of empirical tests examined. A summaray of conclusions is given. ti(Bell-Cornell)
W77-07544

BROADENING THE APPROACH TO EVALUATION IN RESOURCES MANAGEMENT DECISION-MAKING,
Victoria Univ. (British Columbia). Dept. of Geography; and Victoria Univ. (British Columbia). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W77-07545

POWER PLANT SITE EVALUATION: THE CASE OF THE SHARON PLANT IN ISRAEL,
Technion - Israel Inst. of Tech., Haifa. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6G.
W77-07546

REDUCING POWER CONSUMPTION IN IRRIGATION SYSTEMS WITH THE AID OF A MATHEMATICAL MODEL FOR PIPE DIMENSIONING,
Academia de Studii Economice, Bucharest (Rumania). Dept. of Economic Cybernetics.
For primary bibliographic entry see Field 3F.
W77-07547

IMPERATIVES OF WATER RESOURCES PLANNING IN THE DEVELOPING ECONOMY OF INDIA,
Bihar Coll. of Engineering, Patna (India).
T. Prasad.
Indian Journal of Power and River Valley Development, Vol 24, No 7, p 211-213, July 1974. 4 ref.

Descriptors: *Water resources development, *Comprehensive planning, *Economic efficiency, River basins, Projects, Mathematical models, Hydrologic aspects, Data collections, Competing uses, Water demand, Water supply, Water allocation(Policy), Alternative planning, Behavior, Simulation analysis, Optimization, Computers, Systems analysis.
Identifiers: *India, *Developing countries, Systems engineering, Hydrometeorological features, Physical features.

Water continues to play a significant and critical role in the Indian economy. Although India is adequately endowed with water resources, their non-uniformity in spatial as vell as temporal distribution does not correspond with the pattern of diverse uses to which they can be allocated. This leads to the necessity of conservation and allied water resources projects. Since there are competing demands on the financial resources of the developing economy of India, the need for efficiency and optimality in planning these projects cannot be overemphasized. Such efficiency and optimality can be achieved through integrated, flexible, comprehensive planning of the entire river basin, applying the modern concepts of

mathematical modeling and systems engineering. Valid mathematical models utilizing simulation analysis, linear programming, and dynamic programming, for example, need to be formulated and applied. Scientific collection of hydroeconomic information on the basin and the use of a high speed electronic computer for data processing, modeling, and other computational purposes have become necessary. (Bell-Cornell)
W77-07555

SYSTEMS APPROACH AND WATERSHED MODELS,
Regional Engineering Coll., Rourkela (India).
For primary bibliographic entry see Field 2A.
W77-07556

EVALUATING ALTERNATIVE LEVELS OF WATER AND SANITATION SERVICE FOR COMMUNITIES IN THE NORTHWEST TERRITORIES,
Associated Engineering Services Ltd., Edmonton (Alberta).
D. J. Gamble, and C. T. L. Janssen.
Canadian Journal of Civil Engineering, Vol 1, No 1, p 116-128, September 1974. 2 fig, 3 tab, 7 ref.

Descriptors: *Canada, *Evaluation, *Water supply, *Sewers, *Methodology, Water delivery, Capital costs, Operating costs, Alternative planning, Optimization, Data collections, Economics, Decision making, Equations, Mathematical models, Systems analysis.
Identifiers: *Northwest Territories(Canada), Developing regions, Vehicular delivery, Garbage collection, Deterministic model.

Most communities in the Northwest Territories lack the water, sewage, and garbage facilities available in southern Canada. Recently, the Government of the Northwest Territories proposed a multimillion dollar ten-year program to improve the water and sanitation services of the communities under its jurisdication. An ongoing project to upgrade these facilities in settlements of the Territories is described. Presented is a methodology whereby the total cost (operating and capital) of the alternative water, sewage, and garbage systems for each community is evaluated by means of a deterministic model. The analysis defines the level of service to be recommended in each community. Cost data for sanitary installations in the north are generally not available and thus need to be estimated. The costs associated with alternative system are assessed as a function of some one hundred variables, including population, water demand, distance to water source, topography, terrain, weather conditions, severity of climate, existence of roads, availability and cost of gravel, general remoteness of the community, freight rates, etc. The basis for comparison of the various levels of service alternatives is the net present value of the investment required over the duration of the program, including capital as well as operating expenditures. Actual data for some forty-five communities are used in the calculations. (Bell-Cornell)
W77-07557

6B. Evaluation Process

FEDERAL RIVERBASIN PLANNING IN THE COASTAL ZONE: THE LONG ISLAND SOUND STUDY,
Yale Univ., New Haven, Conn. School of Forestry and Environmental Studies.
For primary bibliographic entry see Field 2L.
W77-07232

PUBLIC PARTICIPATION TECHNIQUES AND METHODOLOGIES: A RESUME,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
D. Vindasius.
Social Science Series No. 12, 1974, 30 p., 9 fig., 53 fig., 1 tab. Also available in French.

Descriptors: *Planning, *Methodology, Water resources, Technology, Management, *Reviews, *Canada, United States, Analytical techniques, Model studies, *Social participation.
Identifiers: *Public participation, Case studies.

Discussions are presented of a key preliminary phase of research and action projects concerning public participation in the planning process. A review of past experience in stimulating and using public participation in various forms of planning is considered to identify the lessons which can be learned from this experience so that a viable public participation programme can be formulated. Twelve cases are reviewed; where possible, successful and less successful public participation programmes are compared and contrasted. The role of public participation in planning and what public participation involves, i.e., various techniques and mechanisms and how they should be employed, are examined. Subsequently a general model for public participation programmes is presented. (WATDOC)
W77-07332

THE ECONOMICS OF NATURAL ENVIRONMENTS, STUDIES IN THE VALUATION OF COMMODITY AND AMENITY RESOURCES.
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-07437

THE ENVIRONMENTALLY CONCERNED CITIZEN: SOME CORRELATES,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 6G.
W77-07438

THE EVALUATION OF SIMPLE AND OPTIMAL DECISION RULES WITH MISSPECIFIED WELFARE FUNCTIONS,
Australian National Univ., Canberra. Dept. of Economics.
E. Burmeister, J. Jackson, and S. A. Ross.
Working Paper No. 28, April 1975. 27 p. 2 tab., 19 ref.

Descriptors: *Theoretical analysis, *Economics, *Welfare(Economics), *Mathematical models, Optimization, Model studies, Evaluation, Capital.
Identifiers: *Misspecified welfare functions(Economics).

A simple dynamic model is constructed to overcome analytical problems faced by economic planners in cases where technological development and the welfare criteria have introduced uncertainty into the implementation of optimal growth policy problems. The paper introduces the problem of planning for an economy whose preference structure is unknown, and puts this problem into a simple dynamic context where the personification of social preferences is a common feature. Numerical techniques are used to explore the sensitivity of a range of additive utility indices to alternative policies, including the simple modified 'golden rule' policy. To avoid some of the difficulties with the use of ordinal utility indices, an opportunity cost index in terms of the initial capital requirement is defined and its sensitivity also explored. The capital index is invariant to ordinal utility transforms and has the advantage of making the cost of misspecification of the social welfare function explicit. Three sections of the paper deal with: (1) a description of the basic model and the development strategies used in this approach; (2) a discussion of the numerical techniques for computing and evaluating both optimal and simple policies; and (3) an introduction of the planner's problem and numerical results from using the model.(Ha
W77-07439

WATER RESOURCES PLANNING AND MANAGEMENT GOALS,
Corps of Engineers, Washington, D.C. Central Reports Management Branch.
C. H. Gaum.
Journal of the Water Resources Planning and Management Division, Proceedings of the Society of Civil Engineers, Vol. 103, No. WR1, Proceedings Paper No. 12941, p 73-82, May 1977. 2 fig, 4 tab.

Descriptors: Water resources development, *Planning, *Decision making, *Priorities, Water management(Applied), Environmental effects, Regions, Projects, *Management.
Identifiers: *Government policies, Federal budget, Regional planning.

The goal of water resources planning and management is to utilize water related sources for national economic gain, regional development, enhancement of the environment, and the provision of social betterment. It must be recognized that because of great demands, the resources, including dollars, must be economically managed. Only those projects having high justification will be placed in the budget cycle for implementation. Water resources planners must develop new techniques to shorten the time required to plan and foreset priorities. They must improve reporting methods and present all relevant factors. By doing so, they will be playing more decisive role in the decision-making process. (Bell-Cornell)
W77-07523

PUBLIC PARTICIPATION IN WATER RESOURCE DEVELOPMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydr. lab.
E. Silberman.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings paper No. 12952, p 111-123, May 1977. 15 ref.

Descriptors: *Water resources development, *Social participation, *Public benefits, Planning, Social needs, Flood control, *Minnesota.
Identifiers: *Public opinion, *Public works, Social perception, Urban areas, *Public participation, *Bassette Creek Flood Control Commission(Minn), *Minneapolis area(Minn).

The objectives of a public participation program should be to assure that planners and public have similar concepts of what the problems are and that the proposed solutions are perceived as solutions by both planners and public. Elements of a public participation program are identifying the public, reaching the public, and determining what the public wishes are. These elements are analyzed by recounting the experience of the Bassett Creek Flood Control Commission in establishing a flood control plan for an urbanized and urbanizing area in Minneapolis metropolitan area. The Commission is composed of nine volunteer commissioners, one appointed by each of the nine cities in the basin. The Commission (with the aid of its consulting engineers) was very effective in melding bureaucratic and public input into an acceptable plan where a previous plan prepared under the auspices of a bureaucratic organization was practically shouted down.(Bell-Cornell)
W77-07526

VALUE OF LANDSAT IN URBAN WATER RESOURCES PLANNING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-07527

TEST OF LANDSAT-BASED URBAN HYDROLOGIC MODELING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-07528

MODELING MULTIPLE-USE IN NATURAL AREAS: PART I -- THE BASIC FORMULATION,
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 6A.
W77-07530

CAPACITY EXPANSION AND OPERATIONAL PLANNING FOR REGIONAL WATER-RESOURCE SYSTEMS,
General Motors Corp., Cleveland, Ohio. Fisher Body.
D. E. Kolo, and Y. Y. Haimes.
Journal of Hydrology (Amsterdam), Vol. 32, No. 3/4, p 363-381, February 1977. 7 fig, 2 tab, 23 ref, append.

Descriptors: *Water resources development, *Planning, *Regional economics, *Water allocation(Policy), *Water supply, *Optimization, Mathematical models, Projects, Dynamic programming, Regression analysis, Freshwater, Irrigation water, Decision making, Prices, Costs, Water demand, Cost-benefit analysis, Management, Systems analysis, Equations, Operations research.
Identifiers: *Capacity expansion, *Hierarchical approach, *Benefit maximization, Net benefits, Cost minimization, Power demands, Lagrange multipliers.

Presented is an hierarchical approach aimed at coordinating several different mathematical models in order to achieve the economically optimal regional management of water resources and related land. The overall hierarchical model is based on the assumption that projects have two different types of water (fresh and irrigation) and a power capacity. The system objective is to meet freshwater, irrigation water and power demands while maximizing the present value of the net benefits for the entire region. The hierarchical model structure consists of two levels, and the following decisions are made: (1) a supply model determines a project construction sequence which meets given water and power demands at least cost for a planning time horizon of 30 years; and (2) a demand model finds resource allocation policies which yield the greatest return while meeting all demands. Water and power demands are assumed to be functions of water and power prices, respectively, Thus, the return and cost will be functions of water and power prices. The lower level of the model uses dynamic programming to generate the return and cost of various values of the water and power prices. The regression analysis yields the return and cost as explicit functions of the water and power prices; and irrigation demand sumbodel allocates water, dollars, and crops to each farmed subregion. At the higher level, the empirical functions, generated by the lower level, are solved for the optimal prices. (Bell-Cornell)
W77-07538

SCHEDULING MODELS FOR WILDERNESS RECREATION.
Utah State Univ., Logan. Dept. of Forest Science.
H. C. Romesburg.
Journal of Environmental Management, Vol. 2, No. 2, p 159-177, April 1974. 5 fig, 6 tab, 4 ref.

Descriptors: *Recreation, *Decision making, *Mathematical models, *River systems, Constraints, Camp sites, Canada, Parks, Demand, Equations, Linear programming, Systems analysis.
Identifiers: *Scheduling, *Wilderness areas, Float trips, Hiking trails, Social constraints, Environmental constraints, Minimization, Quadratic programming, Goal programming.

The scheduling of recreation in wilderness areas is explored through mathematical decision modeling. Two hypothetical systems are studied: a system of hiking trails, where the solution is found using quadratic programming; and a river system for recreational float trips, where solutions are derived utilizing quadratic programming, linear programming, and goal programming. Trips are allocated to a known user demand which minimizes the encounters among users, subject to campground capacity constraints. The allocation schedules give information for camp-ground or trail expansion which leads to the greatest reduction in encounters, and the solutions provide upper and lower boundaries for encounters. Attention is given to incorporating these models into decision making, pointing out incompleteness within the models and how this restricts the conclusions which can be drawn. The major difficulty is that people are hostile to the idea of having natural experiences so rigidly programmed. Yet, with increasing demand for recreation from a limited resource base, trade-offs involving freedom of choice must be expected. (Bell-Cornell)
W77-07541

DECISION-MAKING FOR ENVIRONMENTAL RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6G.
W77-07542

ACCOUNTING FOR NON-ECONOMIC GOALS IN BENEFIT-COST ANALYSIS,
Michigan Univ., Ann Arbor. School of Natural Resources.
G. Schramm.
Journal of Environmental Management, Vol. 1, No. 2, p 129-150, April 1973. 1 fig, 5 tab, 27 ref.

Descriptors: *Water resources development, *Cost-benefit analysis, *Planning, *Multiple-purpose projects, Methodology, Resource allocation, Evaluation, Cost-benefit ratio, Constraints, Environment, Rivers, Projects.
Identifiers: *Multiple objectives, Accounting framework, *Non-efficiency goals, *National income maximization, Value judgements, Nonmonetary objectives, Marginal tradeoff ratios, Societal objectives, Net income losses, Impact analysis, Social welfare functions.

Benefit-cost analysis has long been accepted as the major method for assessment of alternative water resource projects throughout the world. Little attention was given to who actually received the benefits and who paid the costs, and little regard was paid to goals other than economic efficiency. Major attempts are underway to develop multiple-goal objective functions that rank other, nonmonetary objectives, such as environmental quality or income distribution, as explicitly as economic efficiency. But there are considerable difficulties. Nonmonetary objectives can be incorporated into single-dimension efficiency functions or imposed as constraints onto the efficiency functions. Neither of these approaches allows for the evaluation of marginal tradeoff ratios between different objectives. It appears more useful to develop for each case several alternative resource allocation plans which emphasize the different objectives in turn. Additionally, a methodology which makes it possible to reduce the scope of the inevitable value judgements consists of the development of an unconstrained income maximization plan first which then can be used to measure the costs, in terms of foregone income gains, of emphasizing other societal objectives. Each of the alternative plans must be accompanied by an impact analysis of the various positive and negative project effects on different societal groups. This paper develops a representative evaluation and accounting framework. It is shown why such commonly used pre-set constraints as minimum benefit-cost ratios, or maximum allowable environmental damages, etc., make little sense in a multiple-objective world. (Bell-Cornell)
W77-07543

TOWARDS SYSTEM MODELS FOR WATER RESOURCE MANAGEMENT,
Leeds Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 6A.
W77-07544

BROADENING THE APPROACH TO EVALUATION IN RESOURCES MANAGEMENT DECISION-MAKING,
Victoria Univ. (British Columbia). Dept. of Geography; and Victoria Univ. (British Columbia). Dept. of Economics.
W. R. D. Sewell.
Journal of Environmental Management, Vol. 1, No. 1, p 33-60, January 1973. 2 fig, 4 tab, 86 ref.

Descriptors: *Water resources development, *Decision making, *Evaluation, *Project planning, Methodology, Management, Cost-benefit analysis, Systems analysis, Economics, Social aspects.
Identifiers: *Policy-making process, Goals achievement matrix, Engineering economic analysis, Intangibles, Weaknesses, Social sciences, Resources management.

The failure of flood control and river development schemes in British Columbia has illuminated the need for comprehensive evaluation which considers broad social, environmental, and institutional consequences as well as economic and financial effects of proposed projects. Increasingly, the region or nation rather than the local area is the appropriate areal unit for evaluation. Using a descriptive model of the policy-making process, the extent to which present procedures for evaluation (Cost-benefit analysis, systems analysis, goals-achievement matrix, and engineering economic analysis) are able to provide the data that decision makers require at various stages of that process is examined. While progress has been made in developing tools for evaluation, there remain important weaknesses which stem in part from the incapacity to identify and measure certain effects (e.g., aesthetics, future values), and in part from institutional biases towards some strategies rather than others. Many of these weaknesses might be overcome through acceleration of social science research in the resources management field, particularly in: identification of the nature and magnitude of resources problems and of the demands for resources-related goods and services; delineation of alternative strategies; hindsight reviews of projects and policies; examination of alternative ways of identifying public views; and development of more sophisticated techniques for considering multiple objectives, multiple strategies, and a wide range of values. A list of specific types of studies that might be undertaken in connection with each of these areas is given. (Bell-Cornell)
W77-07545

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

REPORT OF A STUDY OF CONTROL AGENCY REVENUE FEES,
Environmental Protection Agency, Washington, D. C. Office of Planning and, Management.
For primary bibliographic entry see Field 5G.
W77-07435

6D. Water Demand

REDUCED WATER DEMAND--RESULT OF SWEDISH ANTI-POLLUTION PROGRAM,
For primary bibliographic entry see Field 5D.
W77-07215

ASSESSMENT OF GEOTHERMAL RESOURCES OF THE UNITED STATES--1975.
Geological Survey, El Paso, Tex.; and Geological Survey, Albany, N.Y. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07476

HYDROLOGY,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W77-07494

6E. Water Law and Institutions

REDUCED WATER DEMAND--RESULT OF SWEDISH ANTI-POLLUTION PROGRAM,
For primary bibliographic entry see Field 5D.
W77-07215

P. L. 92-500 V LOCAL PRIORITIES,
Brown and Caldwell, Seattle, Wash.
For primary bibliographic entry see Field 5D.
W77-07229

POLLUTION SUSCEPTIBILITY: AN ENVIRONMENTAL PARAMETER FOR COASTAL ZONE MANAGEMENT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5G.
W77-07230

SCIENTIFIC AND SCENIC RIVERS ACT: COMMENTARY AND MODEL STATUTE,
Natural Resources Defense Council, Washington, D.C.
For primary bibliographic entry see Field 6G.
W77-07231

FEDERAL RIVERBASIN PLANNING IN THE COASTAL ZONE: THE LONG ISLAND SOUND STUDY,
Yale Univ., New Haven, Conn. School of Forestry and Environmental Studies.
For primary bibliographic entry see Field 2L.
W77-07232

CONTROL OF AGRICULTURAL WATER POLLUTION: A CONTINUING REGULATORY DILEMA,
South Carolina Univ., Columbia. School of Law.
For primary bibliographic entry see Field 5G.
W77-07233

LOOKING AHEAD (FEDERAL WATER POLLUTION CONTROL ACT OF 1972).
Environmental Protection Agency, Washington, D.C.
R. E. Train.
Water and Sewage Works, Vol 121, No 7, p cover, 4 (July 1974).

Descriptors: *Federal-state water conflicts, *Permits, *Construction, *Grants, Coordination, Monitoring, Law enforcement, Planning, State governments, Federal government, Water pollution control, Administrative agencies, Industrial wastes, Municipal wastes, Discharge(Water), Penalties(Legal), Governmental interrelations, Local governments.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Decentralization.

In fiscal year 1975 the Environmental Protection Agency's (EPA) two priorities, permits and construction grants programs, represent the quickest route to water quality improvement. A second level priority is enforcement, monitoring and planning. Nonpoint source control will be a matter of regional or state initiative. The priority in the permit program is major industrial and municipal dischargers. Construction grants are expected to total $4.1 billion for fiscal year 1975. In the enforcement program, emphasis will be on the completion of pending actions and on dischargers failing to apply for a permit under the 1972 Amendments to the Federal Water Pollution Control Act (FWPCA). Unquestionably, in the future there will be a steady decentralization of responsibility for meeting the requirements rests with state and local governments. Agencies close to the origins of the pollution must provide direction for abatement and control of water pollution. The challenge of cooperation may be the single, most important facet of the Clean Water Act in order to successfully combat water pollution. (Rieck-Florida)
W77-07235

HOUSE COMMITTEE MARKS UP HR 9560,
For primary bibliographic entry see Field 5G.
W77-07236

NCWQ RECOMMENDS CHANGES IN WATER POLLUTION ACT,
For primary bibliographic entry see Field 5G.
W77-07237

SUBSIDENCE: SETTLING DOWN WITHIN THE LAWS OF ACCRETION, RELICTION, EROSION, AND SUBMERGENCE,
L. E. Davis.
Baylor Law Review, Vol. 28, No. 2, p. 319-37 (1976).

Descriptors: *Texas, *Subsidence, *Avulsion, *Boundaries(Property), *Submergence, Legal aspects, State governments, Judicial decisions, Water law, Water rights, Equity, Real property, Competition, Remedies, Alluvium.
Identifiers: Avulsive change rule, Non-avulsive change rule, Private property.

The inundation of certain lands of subsidence has raised important questions about the legal effects of the change. From court decisions in Texas and other jurisdictions certain principles have been formulated dealing with the loss of land. Where the change is avulsive, the title generally remains in the original owner. However, where change is non-avulsive, the title generally passes to the state subject to certain restrictions. Equitis and reasonable time are influential factors to determine who should be the owners. In keeping with the idea some of the more difficult Texas decisions have proceeded on the theory that as long as submerged lands can be identified, the original owner will not lose his title. Under this Avulsive Change Rule, the original owner retains title subject to divesture in favor of the state should the land not be claimed within a reasonable time. The Non-avulsive Change Rule passes title to the state unless the land is restored within a reasonable time. These rules are the current governing principles. However, since the subsidence problem is social in origin, it would be more appropriate for the legislature to provede a solution for those injured. (Rieck-Florida).
W77-07238

PROPERTY-COASTAL SHORES-PRIVATE PROPERTY RIGHTS UPHELD OVER CLAIMED PUBLIC RIGHT TO RECREATIONAL USE OF BEACH-IMPLIED DEDICATION, EASEMENT BY PRESCRIPTION, PUBLIC TRUST THROUGH CUSTOM AND GRANT, AND DOCTRINE OF SUBMERGENCE NOT APPLICABLE. DEPARTMENT OF NATURAL RESOURCES V. MAYOR AND COUNCIL OF OCEAN CITY, 274 MD. 1, 332 A.2D 630 (1975).
J. J. Nolan, Jr.
Baltimore Law Review, Vol. 5, No. 2, p. 349-72 (1976).

Descriptors: *Maryland, *Beaches, *Recreation, *Public rights, Regions, Seashores, Shores, Judicial decisions, Recreation facilities, Construction, Sands, State governments, Legal aspects, Public access, Competing uses, Public benefits.
Identifiers: Foreshore, Dry sand, Private property.

Faced for the first time with the rights of private property owners versus the rights of the public in the dry sand portion of the beaches, the Maryland Court of Appeals resolved several recent cases in favor of private property rights. In one case the majority upheld the right of developers to construct a condominium on the dry sand portion of the beach. In a companion case the court upheld the landowners's right to erect a house on the dry sand. In its discussion of leagal principles the court observed the power of the state to hold the foreshore for the benefit of the public. However, in considering the dry sand portion of the beach the court rejected various legal theories favoring public rights. Although the majority considered the law of implied dedication, it failed to find a sufficiently clear and unequivocal manifestation of intent that is crucial to the doctrine. In view of the court's reluctance to acknowledge the public's right to the beaches, the ultimate solution lies in legislative articulation of an assumed public policy and the enactment of a comprehensive legislative program. (Rieck-Florida)
W77-07239

THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 AS APPLIED TO THE SURFACE MINE IN WEST VIRGINIA - POLLUTANT DISCHARGE PERMIT REQUIREMENTS,
For primary bibliographic entry see Field 5G.
W77-07240

RESEARCH AND THE QUEST FOR CLEAN WATER,
Water Pollution Control Federation, Washington, D.C. Board of Control Research Committee.
For primary bibliographic entry see Field 5G.
W77-07243

THE 1973 IMCO CONVENTION: TIGHTENING THE CONTROLS ON OPERATIONAL OIL POLLUTION FROM TANKERS,
For primary bibliographic entry see Field 5G.
W77-07244

THERMAL POLLUTION AND ITS CONTROL,
Washington Univ., St. Louis, Mo. Dept. of Chemical Engineering; and Washington Univ., St. Louis, Mo. Program in Technology and Human Affairs.
For primary bibliographic entry see Field 5G.
W77-07245

HOW THE ARMY DOES A BANG-UP JOB OF TREATING EFFLUENTS,
Picatinny Arsenal, Dover, N.J. Modernization and Special Technology Div.
For primary bibliographic entry see Field 5D.
W77-07247

THE EVOLUTION OF APPROACHES TO FLOOD DAMAGE REDUCTION,
Oregon State Univ., Corvallis. Dept. of Geography.

For primary bibliographic entry see Field 6F.
W77-07248

EVOLUTION AND OBJECTIVES OF RIVER BASIN COMMISSIONS IN THE UNITED STATES,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
W. Kiechel, Jr.
In: Proceedings of the International Conference on Global Water Law Systems, International Association for Water Law, September 1-9, 1975, Valencia Spain; Published by Colorado State University, Ft. Collins, Colorado 80523, p. 1251-56, 1976.

Descriptors: *Water resources development, *River basins, *River basin commissions, *Water Resources Planning Act, Water conservation, Planning, Comprehensive planning, Federal government, State governments, Local governments, Governmental interrelations, Decision making, Water resources, Water policy, Water utilization.
Identifiers: *Great Lakes Basin Commission.

The Water Resources Planning Act was enacted by Congress on July 22, 1965, in response to a need for an improvement of planning in development of water resources. Its policy was to encourage the conservation, development and utilization of water resources by involving federal, state, and local governments, and others, in the regional planning. The Act authorized creation of river basin commissions at the initiative of state governments. The work of preparing a comprehensive plan for development of water resources is given to the commissions, whose progress and effectiveness are analyzed here by the author, a member of the Great Lakes Basin Commission. The work of the commissions has been disappointing for the following reasons: (1) the stress placed upon achieving consensus, where the members are representatives of federal, state and interstate agencies, has diluted the commissions' decision-making capabilities; (2) their procedure of quarterly meetings has facilitated postponement of difficult issues. The author concludes that the commissions have not proved suitable as decision-making vehicles, but that, because of their broad base, they are outstanding vehicles for discussion and debate among federal, state and local interests, of planning for development of water resources on a regional level. (Jones-Florida)
W77-07249

SOME SUGGESTIONS FOR THE MANAGEMENT OF INTERNATIONAL RIVER BASINS,
New Mexico Univ., Albuquerque. School of Law.
A. E. Utton.
In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; published by the Commission for the National Water Resources Development Plan (COPLANARH), Caracas, Venezuela, p. 914-928, 1976. 13 ref.

Descriptors: *International Boundary and Water Commission, *Riparian rights, *River basin commissions, *International law, Water rights, River basins, Judicial decisions, Treaties, Water policy, Basins, Riparian waters, Legal aspects, Water law, Relative rights, Comprehensive planning, International commissions, Rivers, Political aspects.
Identifiers: *Comparative law, *Sovereignty, Equitable utilization, Territorial sovereignty, Coriparian rights, Cobasin states, Helsinki Rules.

International practice concerning water use of coriparians has not followed the theory of absolute sovereignty, but has adhered to the principles of limited territorial sovereignty. Under the latter theory, a state may make use of water flowing through its territory as long as the use does not interfere with the reasonble use by coriparians. Currently, international water policy is based on treaties, the Helsinki Rules, national judicial decisions, and the equitable utilization doctrine. In place of these, an international commission that uses persuasion, rather than coercion, to formulate water policy should be developed. A suggested design is a hierarchical two-tier approach in which the commission acts as a catalyst by acquiring information, formulating policy recommendations, and disseminating both to the cobasin states. The commission would focus on policy planning and review, and would maintain an ongoing overview of the activities of all basin states. The commission would need to be supported by a scientific component that would supply unbiased data. Policy execution and regulation of the resources would remain in the hands of the cobas in states under this plan. The commission must maximize the political response by the states in carrying out coordinate basin policies. (Petruff-Florida)
W77-07250

RULES FOR THE PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN BULK,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-07251

PROPOSED TOXIC POLLUTANT EFFLUENT STANDARD FOR POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 41, No. 143, p. 30468-77, July 23, 1976.

Descriptors: *Polychlorinated biphenyls(PCB's), *Aroclors, *Industrial wastes, *Pollutant identification, Water pollution sources, Public health, Pollutants, DDT, Chemical analysis, Water pollution control, Water quality, Water law, Regulations, Standards, Legal aspects, Social aspects, DDD, DDE, Aquatic algae, Aquatic life.
Identifiers: *Administrative regulations, *Effluent limitations, Hazardous substances.

In view of recent studies revealing polychlorinated biphenyls (PCB's) as highly toxic and dangerous pollutants the Environmental Protection Agency (EPA) has proposed new standards controlling PCB discharge. Monsanto, the only PCB manufacturer in the United States and manufacturers of electrical transformers and electrical capacitors which use PCB compounds for part of the dielectric are the major sources of PCB pollution. Water is unnecessary to the processes carried out by any of the above manufacturers. Therefore, the proposed effluent standards prohibit any PCB discharge, except in the very specialized circumstances set forth herein. Extensive background information is presented on the composition and properties of PCB's, their importance in several industries, and their toxic effects. The toxicity of the pollutant, its persistance, degradability, the usual or potential presence of affected organisms in any waters, the importance of the affected organisms, and the nature and effect of the toxic pollutant on such organisms are the factors which were considered in formulating the proposed rules. In light of the grave dangers PCB's pose to aquatic life and human health at very low concentration levels any further contamination must be avoided. (Moorhouse-Florida)
W77-07253

RULES AND REGULATIONS FOR PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN DOMESTIC TRADE,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-07254

AMEND THE FEDERAL BOAT SAFETY ACT OF 1971 (HEARINGS ON S. 3214 TO DECLARE CERTAIN WATERS OF NEW HAMPSHIRE TO BE NON-NAVIGABLE FOR CERTAIN PURPOSES).
Hearings--Committee on Commerce, United States Senate, April 9, 1976, Serial No 94-76. 121 p.

Descriptors: *New Hampshire, *Federal-state water rights conflicts, *Non-navigable waters, *Boating regulations, Income, Legal aspects, Federal jurisdiction, State jurisdiction, Water rights, Legislation, Bodies of water, Political aspects, Water pollution, Lakes, Governmental interrelations, Navigable waters.
Identifiers: *Congressional hearings, Navigability.

A hearing held by the United States Senate Committee on Commerce on April 9, 1976, was concerned with several issues. The initial one was one of navigability. 'Are the New Hampshire Lakes Winnisquam and Winnipesaukee and the Merrimack River which flows from them, a part of a federal waterway for purposes of interstate commerce, and therefore under Federal jurisdiction.' The plethora of tests and precedents on the issue of navigability makes the question a difficult one. The second issue dealt with money. Federal officials predict the state will gain if the water in question is put under federal jurisdiction. On the other hand, state officials have estimated a revenue loss. Another issue concerned an attempt by the federal government to lower New Hampshire standards for clean water, boating safety and legal liability. A fourth issue questioned how federal jurisdiction might affect the law suits arising from boating accidents on the lakes. Finally, a less precise, but in many ways more important, issue is the aspect of states' rights and centralized government. (Rieck-Florida)
W77-07255

A SCIENTIFIC AND LEGAL LOOK AT THERMAL POLLUTION,
Florida Univ., Gainesville. Coll. of Law.
W. D. Anderson.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, $1.15. March 28, 1970, 22 p.

Descriptors: *Thermal pollution, *Electric power industry, *Florida, *Heated water, Nuclear powerplants, Pollutant identification, Pollutants, Pollution abatement, Temperature, Water cooling, Water pollution sources, Water temperature, Cooling towers, Cooling water, Water Quality Act, Upwelling, Irrigation.

It is necessary to balance man's need for electrical power with the resulting thermal pollution. Whether a fossil-fueled or a nuclear generator is used, water is necessary for cooling purposes. The National Technical Advisory Committee has published its Report on Water Quality Criteria with its recommendations regarding water temperature for both fresh water, marine and estuarine organisms. However, not all scientists agree with these recommended temperature standards. Nevertheless, it has been suggested that the heated effluent may be used for beneficial purposes. Such ideas include de-icing waterways, 'upwelling' to increase fish population, and warm water irrigation. Possible solutions to thermal pollution are cooling towers or cooling ponds. The primary legal weapon to control water pollution is based on the Water Quality Act of 1965. The report's conclusion focuses on a recent case involving a Florida power company's discharge which purportedly caused ecological damage. In the final analysis, careful planning in the creation of electricity could produce both fish and power. (Rieck-Florida)
W77-07256

CONSUMPTIVE USE OF GROUND WATER,
Florida Univ., Gainesville. Coll. of Law.
R. Watson, and J. Merritt.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, $1.50. (1970), 29 p.

Descriptors: *Artificial recharge, *Groundwater recharge, *Groundwater, *Water wells, Water supply, Water reuse, Surface-groundwater relationships, Water storage, Permits, Regulation, Legal aspects, Well permits, Cost analysis, Water storage, Water management(Applied).
Identifiers: Incidental recharge, Applied recharge, Induced recharge, Water Resources Act.

An increasing incidence of water shortage has prompted measures to preserve the supply of ground water. One approach to preservation is regulating the use of water through a well permit system. however, a more positive solution may be a process known as artificial recharge. Incidental recharge, induced recharge and applied recharge are three artificial means to augment water supplies. Each application of artificial recharge must be evaluated to see if it is feasible both in cost and physical terms. The criteria for evaluation could vary from one district of the state to another. There should be flexibility in the outlook for storage and recharge, and new legislation must contemplate future decision-making in the area of underground storage and artificial recharge. To enable each district to meet its specific problems to be remedied by artificial recharge, the Water Resources Act should provide for a specific delegation of legislative authority authorizing each Water Management District to implement rules and regulations dealing with artificial recharge as each district sees fit subject to the supervisory power of the Water Resources Board. (Rieck-Florida)
W77-07257

FLORIDA STATUTES, CHAPTER 253--THE 1969 AMENDMENTS AND PROPOSED LEGISLATION,
Florida Univ., Gainesville. Coll. of Law.
E. Dunwody.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, $1.25. 1970, 24 p.

Descriptors: *Florida, *Freshwater, *Dredging, *Navigable waters, Management, Lake beds, Rivers, Streams, Boundary disputes, Boundaries(Property), Water rights, Protection, Administration, Legal aspects, Permits, Regulation, Water law, Beds, Estuaries, Legislation, Estuarine environment.
Identifiers: Trustees Internal Improvement Trust Fund, *Fill permits, *Submerged lands.

Indiscriminate filling and dredging of navigable fresh water submerged lands is as detrimental as indiscriminate filling and dredging of tidal submerged lands. Legislation designed to more uniformly manage Florida's subaqueous lands has been passed in an effort to manage lands underlying navigable fresh water lakes, rivers and streams. Private owners and conservationists continue to demand legislative enactments which will simplify and promote public interests, but still adequately protect private rights. The 1969 Act enables the Trustees of the Internal Improvement Trust Fund to regulate navigable freshwater rivers and streams, thereby giving them a means to protect estuarine areas from indiscriminate filling and dredging. Future proposed legislation designed to address the problems of boundary disputes may be subject to legislative resistance due to the method chosen to establish the boundary line. The proposed bill also contains a provision which will add a degree of certainty to the rights of future purchaser to dredge and fill. These are but a few of the continuing problems encountered in managing the state's submerged lands. Therefore, future legislative enactments must be responsive to future problems. (Rieck-Florida)
W77-07258

THE FEASIBILITY OF A WATER IMPORTATION PROJECT FOR SOUTH FLORIDA,
Florida Univ., Gainesville. Coll. of Law.
S. C. Frasier.
Available from Easternm Water Law Center, University of Florida, Gainesville, Florida 32611. $1.25. 1969, 22 p.

Descriptors: *Florida, *California, *Potential water supply, *Imported water, *Desalination, Water supply, Dependable supply, Pipelines, Water allocation(Policy), Water costs, Water delivery, Water demand, Water distribution(Applied), Water importing, Water management(Applied), Water resources, Water shortage, Watersheds(Basins), Legal aspects, Regulation, Financial feasibility.

Additional supplies of water may be necessary in order to supply adequate amounts of water to Florida's growing population. This paper deals with the feasibility of transferring water from an area of surplus to an area of great demand. The financial feasibility, legal problems, allocation problems, and administrative problems are all considered. The California water plan is studied as a model, with a comparison of Florida's and California's geographical similarities. However, if financial feasibility is the determinative factor, desalination may be more desirable. The constitutionality of water regulatory statutes is a major legal problem to consider. This issue may rest on the degree to which riparian rights are altered. In regard to allocation, equitable assurances of adequate supplies must be made to both the water transfer and water basin areas. Finally, reasonable regulations regarding administration has generally been upheld, with state water regulatory agencies being held constitutional. (Rieck-Florida)
W77-07259

ECONOMIC ASPECTS OF POLLUTION ABATEMENT, PART I,
Florida Univ., Gainesville. Coll. of Law.
C. L. Davis.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, $1.15. (1970), 22 p, 3 fig.

Descriptors: *Florida, *Economic feasibility, *Industrial wastes, *Waste water treatment, *Pollution abatement, Water pollution control, Water pollution sources, Economic impact, Industrial water, Industries, Water pollution, Air pollution, Pollutants, Solid contamination effects, Solid wastes, Treatment facilities, Waste treatment.

The economic aspects of water pollution must be understood before beneficial legislation can be drafted. Here, a Florida industry with a forward-looking management was chosen as an example of an industrial polluter. The industry's cooperative and pioneering attempts to deal with water and air pollution are analyzed. Various pollution abatement plans were considered and rejected until a three phase program was accepted. Phase one consisted primarily of a collection device for solids. Phase two's clarifier completed primary treatment of the water. Finally, phase three utilized a mechanically aerated lagoon for secondary treatment. This attempt at pollution abatement is the normal pattern in dealing with heavy industry. While specific problems differ with varying locations, a similar or competing industry is remarkably alike in its approach to public relations and economic policy. Public embarrassment exerts a stronger motivating force than a legislator or bureaucrat can ever apply. Solutions to the problem of pollution must consider the economic realities of competition and the technological capabilities available. Uniform federal laws can be passed to effectively clean up industrial pollution at an equivalent increase to the consumer in the price of a particular product. (See also W77-07261) (Rieck-Florida)
W77-07260

LEGAL ASPECTS OF CHANGES BROUGHT ABOUT BY BUCKEYE'S POLLUTION ABATEMENT PROGRAM, PART II,
Florida Univ., Gainesville. Coll. of Law.
C. L. Davis.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida, $.74. October 1, 1970. 11 p.

Descriptors: *Florida, *Discharge(Water), *Industrial wastes, Water pollution sources, Water pollution, Pollutants, RIvers, Zoning, Steam, Generators, Air pollution effects, Inspection, Regulation, Law enforcement, Rivers and Harbors Act, Federal Water Pollution Control Act, Legal aspects, Administrative agencies, State governments.

Changes in Florida industry's water pollution control program may have legal implications that significantly affect the operation of the program. These changes include the use of a lagoon to collect sludge, a greater collection of solids that are burned in the dump, and alterations in the discharge point into the river and the water quality. A right to discharge into the Fenholloway River was originally granted by Florida law. Possible restrictive zoning, odor and pollution of underground water supplies must be considered in connection with the sludge lagoon. The bulk of pollutants taken from the water is used to fuel steam generators. Before discharging smoke and contaminants into the air the provisions of the state's Air and Water Pollution Control Act must be met. The Federal Water Pollution Control Act and the Rivers and Harbors Act restrictions must also be followed. Finally, state regulation classifies water, and creates powers of inspection which curtails unlawful discharges which cause pollution. Failure to comply with these various regulations may result in serious civil and criminal sanctions accompanied by expensive litigation. (See also W77-07260) (Rieck-Florida)
W77-07261

PECOS RIVER COMPACT.
Texas Water Code Ann. secs 42.001 thru .010 (1972).

Descriptors: *Water resources development, *New Mexico, *Texas, *Interstate compact, Interstate rivers, Water law, Regulation, Interstate, Interstate commissions, Governments, State governments, Political aspects, Water policy, Construction, Public health, Floods, Water utilization, Consumptive use, Water quality, Salinity, Administrative agencies, Legal aspects, Prior appropriation, Beneficial use, Water rights.
Identifiers: *Pecos River(Tes-N Mex), *Pecos River Compact, Administrative regulations.

The Pecos River Compact provides equitable division and apportionment of the use of the Pecos River waters. It promotes interstate comity between Texas and New Mexico, removes causes for controversy and protects development within the two states. It also facilitates the construction of works for the salvage of water, more efficient use of water and for the protection of life and property from floods. Under the compact, beneficial use shall be the basis, measure and limit of the right to use water. This beneficial consumptive use of water is apportioned between the states. The states are pledged to alleviate the salinity conditions of the Pecos River. The compact creates an interstate administrative agency and specifies guidelines concerning the duties and powers of the commission's representatives. The principle of prior appropriation shall be applied to maintain flows at the New Mexico-Texas state line. The compact includes provisions to insure that: (1) states importing water have exclusive rights to

such water, and (2) failure to use apportioned water does not constitute an abandonment of the right to such use. (Rieck-Florida)
W77-07262

ARTESIAN WELLS AND STORAGE RESERVOIRS, AND WORKS CONNECTED THEREWITH.
Kan Stat Ann secs 42-401 thru -506 (1972).

Descriptors: *Kansas, *Artesian wells, *Water sources, *Water supply, Legislation, Regulation, Permits, Governments, Administration, Administrative agencies, Confined water, Aquifers, Pressure, Subsurface waters, State governments, Law enforcement, Legal aspects, Water wells, Wells, Local governments.
Identifiers: Licenses, Administrative regulations, Nuisance(Legal aspects).

Kansas defines an artesian well as a well sunk over 400 feet deep, from which water is raised to the surface by artificial or natural means. Any such well that is not tightly capped will be considered a public nuisance. Permitting wastes from the wells is a misdemeanor. Furthermore, expenses incurred in abating unlawful wastes shall become a lien on the land. Water may be conducted over 1 1/2 to 2 1/2 miles from the well, depending on the manner of conveyance. The manner in which water from artesian wells may be used for stock is strictly regulated to prevent waste. Drilling requirements, bond inspections and casing regulations must be met before an artesian well may be drilled. To carry out the provisions of the act, interested counties must create a board and have a convention to elect commissioners to settle all disputes between the county artesian well supervisor and the owner or occupant of the land upon which the dispute has arisen. The duties of the supervisor and details concerning the license fee and permits are enumerated in the statute. (Rieck-Florida)
W77-07263

ENCROACHMENTS ON NAVIGABLE LAKE.
Idaho Code Ann secs 58-142 thru -153 (Supp 1976).

Descriptors: *Idaho, *Navigable waters, *Encroachment, *Construction, *Beds, Legal aspects, Water law, Legislation, Ownership of beds, State governments, Riparian rights, Remedies, Littoral, Regulation, Permits, Control, Law enforcement, Judicial decisions, Penalties(Legal).
Identifiers: Non-navigational encroachment, Commercial encroachment.

There shall be no encroachments in, on or above the beds or waters of any navigable lake in the state of Idaho unless proper approval has been given. The power to regulate such encroachments is vested in the board of land commissioners. Applications for the construction or enlargment of all navigational encroachments shall be processed by the board with a minimum of procedural requirements. If the encroachment will infringe on the riparian or littoral rights of an adjacent property owner, he must be given notice of the application, whereupon he has the right to object to the encroachment. These specified permit procedures apply to all nonnavigational or commercial navigational encroachments which extend beyond the line of navigability. Any violation of the regulations may result in a fine and may restrain the property owner by means of injunction. Anyone found legally encroaching on the navigable waters may be judicially directed to restore the lake to its previous condition. Current vested water rights will not be affected by the statute. The state has no claim to lands lying above the ordinary high water mark of any navigable lake. (Rieck-Florida)
W77-07264

APPROPRIATION OF WATER--PERMITS, CERTIFICATES AND LICENSES--SURVEY.
Idaho Code Ann secs 42-201 thru -240 (1948), as ammended, (Supp 1976).

Descriptors: *Idaho, *Water quality control, *Water resources development, *Permits, *Water utilization, Administrative agencies, Legislation, Regulation, Natural resources, Environmental effects, Administration, State jurisdiction, Water demand, Water rights, Wells, Drilling, Well regulations, Administrative decisions, Adoption of practices, Local governments, Groundwater, Legal aspects.
Identifiers: Critical ground water area.

This chapter provides the manner in which the waters of the state of Idaho shall be controlled and administered. The title provides application, permit, and license procedures. Prohibitions are put on the diversion of private waters. Persons using diverted water must prove that the water was actually used for the intended beneficial purpose. The chapter also addresses: change in point of diversion or place of use of water under established rights; department duties dealing with survey of appropriations; filing claims of rights established by diversion and use; recording of claims; ground waters established as public waters; drilling and use of wells for domestic purposes; drilling and use of wells for drainage or recovery purposes; methods of appropriation; duties of the director of the department of water resources; definition of 'critical ground water area'; abandonment of water right; powers of the director of the department of water resources; administrative determination of adverse claims; local ground water boards; adjudication of water right; penalties; water administration fund; application for the right to exchange water. (Rieck-Florida)
W77-07265

RIGHT TO ACCRETION BUILT UP FROM ONE TRACT OF LAND AND EXTENDING LATERALLY IN FRONT OF ADJOINING TRACT WITHOUT BEING CONTIGUOUS THERETO.
61 ALR 3d 1173-94 (1975).

Descriptors: *Accretion, *Boundaries(Property), *Riparian rights, *Riparian land, Legal aspects, Water law, Water rights, Alteration of flow, Banks, Navigable waters, Ownership of beds, Relative rights, Riparian waters, Severance, Judicial decisions, Legal review, Adjacent land owners, Avulsion, Bank erosion, Boundary disputes.
Identifiers: *Real property law, *Property interests.

Deposits of alluvion caused by accretion generally benefit the riparian owner. In the usual case, a riparian owner's boundaries are extended outward due to the accretion. The justification for such a principle is either that it falls within the maxim de minimis lex non curat, or that since a riparian owner is liable to lose soil by encroachment of the water, he should also have the benefit of any land gained by the converse situation. A different problem arises when the accretion build up from one tract of land extends laterally in front of an adjoining tract to which it is not contiguous. Under such conditions, courts have almost unanimously ruled that the owner to which the accretion is contiguous cannot claim a property right to any portion which crosses the boundary line of an adjoining landowner. Thus the adjoining landowner acquires title to a portion of the accretion even though it is not contiguous to his land. The justification for this view is that the major right of any riparian owner is access to the water, and that no riparian owner will be allowed to increase his access at the expense of an adjoining riparian owner. The only case contra to this principle was decided in Florida where title to the accretion was granted to the tract of land to which it was attached. The court held that tidal waters (the Gulf of Mexico) required a different rule. (Moorhouse-Florida)
W77-07266

BUNGER V. UNCOMPAHGRE VALLEY WATER USERS ASSOCIATION (CONDITIONAL WATER PERMITS).
557 P.2d 389-95 (Colorado 1976).

Descriptors: *Colorado, *Water resources development, *Permits, Water law, Water rights, Resources development, Water supply development, Administration, Regulation, Conservation, Water utilization, Water allocation(Policy), Water conservation, Judicial decisions, Legal aspects, Potential water supply, Water policy, Local governments, Appropriation, Legal review.
Identifiers: *Conditional water permits, Water Rights Determination and Administration Act, Standing, Water courts, Summary judgments, Conditional water rights.

Applicant for conditional water decrees presented four arguments appealing the defendants' denial of his applications which set out rough guidelines for a massive water collection, diversion and storage plan. Appellant first contended that the defendants' water courts must hold hearings in every contested water right situation regardless of the merits. The Supreme Court of Colorado held that a summary judgment is proper where there is no issue as to any material fact. Appellant's second contention was that objectors-appellees lacked standing to file objections in the water courts. The state Supreme Court held that the Water Rights Determination and Administration Act gave the cities, board of county commissioners and conservation districts standing to challenge applications for conditional water rights. Appellant's third argument that summary judgment was improper was also struck down by the court. Finally, the court disagreed with appellant's fourth contention that the water court misinterpreted the necessary first step prior to obtaining the decree. The court held that appellant could not claim, as his first step, work he completed as an employee for the reclamation bureau. (Rieck-Florida)
W77-07267

SCHULTZ V ATKINS (CLAIM FOR EASEMENT BASED ON CONTRACT FOR WATER RIGHTS BETWEEN PREDECESSORS IN TITLE).
554 P.2d 948-53 (Idaho 1976).

Descriptors: *Easements, *Idaho, *Prescriptive rights, *Contracts, *Water contracts, Legal aspects, Water law, Wells, Water rights, Domestic water, Judicial decisions, Water delivery, Water, Land tenure, Land, Real property, Competing uses.
Identifiers: Property, *Property rights, *Property interests, *Licenses, Prescriptive easements.

Plaintiff landowners brought action against owners of adjacent land seeking a permanent right to have culinary and domestic water delivered from the well on defendant's land. The basis for the action was a contract which had been executed previously between the predecessors in title to both pieces of property. Plaintiffs contended that this contract had resulted in their predecessors' acquisition of an easement which had passed to them with title to their land; defendants denied this and counterclaimed to enjoin plaintiffs from asserting any claim to the well or to the defendants' property. Plaintiffs also contended that their predecessor had by terms of the contract acquired a license for the delivery of water, which the defendants denied. The Seventh Judicial District Court of Idaho held for the plaintiffs, but did not differentiate between an easement or a license, or define the legal basis for its finding. The Supreme Court of Idaho reversed. The holding of the court was that an easement may be created by express agreement, by implication, or by prescription, and that none of these were proven by the plaintiffs. The court further stated that the essential element of a license is the right to use land in the posses-

sion of another, which the contract for delivery of water had not granted. (Sloan-Florida)
W77-07268

RAPPL AND HOENIG COMPANY, INCORPORATED V. NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (APPLICABILITY OF FRESH WATER WETLANDS ACT TO ARTIFICIALLY CREATED WETLANDS).
387 N.Y.S.2d 985-88 (Sup. Ct. 1976).

Descriptors: *New York, *Wetlands, *Freshwater, *Permits, Administrative decisions, Judicial decisions, Regulation, Condemnation, Legal aspects, Surface water, Legislation, Water conservation, Administrative agencies, State government, Water law, Water management(Applied), Water resources, Constitutional law.
Identifiers: Administrative regulations.

The owner of a parcel of land sought judicial review of the Department of Environmental Conservation's determination that a portion of the parcel was fresh water wetland subject to Article 24 of the Environmental Conservation Law, entitled Fresh Water Wetlands Act. Petitioner's argument against respondent's determination was that the statute is applicable only to 'natural wetlands'. The Supreme Court held that the statute is applicable to artificially created wetlands as well as natural wetlands, and that to hold otherwise would require respondent to undertake the inordinate burden of determining the origin of each and every proposed wetland throughout the state. Petitioner further contended that the determination that one-half of his property was wetland constituted a 'taking' of his land, and therefore the court should require the Commissioner to proceed to condemnation. The court concluded that relief by condemnation could only be sought after the Commissioner acted on an application by the landowner for an interim permit. As the petitioner had merely made an inquiry as to whether or not his land would be designated freshwater wetland, and had not made application for an interim permit under the statute, he was not entitled to such relief. (Hilburn-Florida)
W77-07269

PORT ACRES SPORTMAN'S CLUB V MANN (PUBLIC'S RIGHT TO USE NAVIGABLE WATERS OVER PRIVATELY OWNED SUBMERGED LANDS).
541 SW2d 847-51 (Tex Ct Civ App 1976).

Descriptors: *Texas, *Navigable waters, *Ownership of beds, *Non-navigable waters, *Streambeds, Channel morphology, Legal aspects, Public rights, Public access, Patents, Water rights, Water law, Water users, Trespass, Competing uses, Judicial decisions, Submergence.
Identifiers: *Injunctive relief, *Submerged lands.

Plaintiff sports club brought this suit against defendant fishermen to enjoin entry and interference with its alleged exclusive use of waters which now cover its property. Defendents contend that the water covering plaintiff's property is both navigable in fact and navigable under Texas statute. Defendents also seek to enjoin the further maintenance of a fence across the disputed waters. Plaintiff contends that since the waters were not navigable at the time the title to the underlying land was issued from the state, the fact that the waters have subsequently become navigable does not deprive plaintiff of its exclusive right to use of the waters and title to the underlying land. The court held that plaintiff did not lose title to the underlying land, but did lose the exclusive right to use the waters. The title to the submerged land does not change because it was not covered by waters of a navigable stream when patented. The artificial change in the river which resulted in the submergence of plaintiff's property does take away plaintiff's exclusive right to use of the waters, and gives such navigable waters a public nature. (Welch-Florida)
W77-07270

AMDEL PIPELINE INC V STATE OF TEXAS (STATUTORY REQUIREMENT OF PAYMENT FOR SPOIL DREDGED FROM BOTTOM OF APPROACHES TO CORPORATE LOADING DOCKS).
541 SW2d 821-26 (Texas 1976).

Descriptors: *Texas, *Spoil banks, *Dredging, *Compensation, *Permits, Channel improvements, Excavation, Navigable rivers, Navigation, Streambeds, Ownership of beds, Canals, Navigable waters, Water permits, Legal aspects, Legislation, Regulation, State governments, Jurisdiction.

Plaintiff ship terminal facilities owner brought this action against defendant state seeking a declaratory judgement that plaintiff was not statutorily required to pay defendant for spoil dredged from the channel approaches to plaintiff's loading docks. Defendant contends that under state law plaintiff may remove no material from the submerged lands except by state approval and payment of 25 cents per cubic yard for materials removed. Plaintiff contends that the river channel maintenance is the responsibility of the Army Corps of Engineers and that plaintiff received a dredging permit from the Corps, but that the state refused to issue a permit unless it was conditioned upon the payment. The Texas Supreme Court held that defendant had no statutory authority to require plaintiff to obtain a permit for the taking of materials from the bottom of the river under these circumstances. The state did have authority to issue permits for commercial shell dredging on lands patended to the navigation district so long as the dredging did not interfere with navigation. In this situation, plaintiff's operations were both necessary and incidental to navigation and were done under federal authority. (Welch-Florida)
W77-07271

OLSON V BEDKE (FAILURE OF TENANT TO PUT WATER ON LEASED LAND TO BENEFICIAL USE).
555 P2d 156-63 (Idaho 1976).

Descriptors: *Irrigation systems, *Idaho, *Irrigation, *Appropriation, *Beneficial use, Water rights, Legal aspects, Water law, Water, Judicial decisions, Leases, Land, Real property, Agriculture, Alfalfa, Water allocation(Policy), Water distribution(Applied), Adjudication procedure, Farms, Farm management.
Identifiers: *Covenants, *Property interests.

Action was instituted by plaintiff lessors to terminate a ten year lease on farmland, and to recover damages because of alleged failure of defendant lessees to comply with the terms of the lease. The lease had called for defendants to farm the property in a 'good and farmer-like manner', to construct and maintain an irrigation system, and to put to beneficial use all decreed water on the land each year. Plaintiffs alleged that defendants had not conustructed a proper irrigation system and that consequently weeds and erosion were placing the land in danger of irreparable harm. Plaintiffs further alleged that by failing to put the waters on the land to full beneficial use, the waters of the stream on the land were flowing off at such a fashion as to subject them to appropriation, endangering the water rights of plaintiffs. The trial court dismissed the complaint as being premature, since seven years remained on the lease. The Supreme Court reversed and remanded for trial, holding that a factual determination should be made as to whether the defendant was committing waste, and that the plaintiff's water rights were in danger under Idaho law. (Sloan-Florida)
W77-07272

UNITED STATES V ASHLAND OIL AND TRANSPORTATION COMPANY (USE OF THE WORD 'NAVIGABLE WATERS' IN THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 HELD TO MEAN 'WATERS OF THE UNITED STATES').
6 ERC 1991-92 (W D Ky Sept 25, 1973).

Descriptors: *Kentucky, *Water pollution control, *Water pollution sources, *Water pollution effects, Water pollution, Water quality control, Water quality standards, Water quality, Discharge(Water), Navigable waters, Navigable rivers, Federal jurisdiction, Federal government, Federal Water Pollution Control Act.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Plaintiff brought this action against defendant oil company for its failure to immediately notify an appropriate federal agency after ascertaining that it had discharged oil into a nonnavigable stream. Defendant was charged under Section 311(b)(5) of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. Defendant contended that under Section 311 of the Act, the action would lie only for discharges into navigable waters as defined in the classical sense, and therefore it would not grant jurisdication to the plaintiff in this case. The district court found that sufficient definitions were provided in the FWPCA that defined 'navigable waters' as 'waters of the United States'. The court further held that plaintiff, under the Act, is not required to establish the effect on interstate commerce of any particular discharge or of any particular stream. Defendnat' motion to suppress evidence obtained by the exploitation of the defendant's notification was denied along with defendant's motion for acquittal. (Welch-Florida)
W77-07273

UNITED STATES V CUTTER LABORATORIES, INC (CIVIL LIABILITY OF A PERMITTEE FOR WHOM NO INDUSTRIAL EFFLUENT LIMITATIONS OR GUIDELINES EXIST).
413 F Supp 1295-99 (ED Tenn 1976).

Descriptors: *Tennessee, *Permits, *Effluents, *Industrial wastes, Civil law, Administrative decisions, Legal aspects, Judicial decisions, Legislation, Penalties(Legal), Law enforcement, Water pollution sources, Discharge(Water), Water pollution, Administrative agencies, Regulation.
Identifiers: *National Pollution Discharge Elimination System (NPDES) permit, Administrative regulations, Engineering judgment.

Plaintiff sought to collect civil money penalties for alleged violations of a National Pollution Discharge Elimination System (NPDES) permit. Plaintiff had issued a permit to defendant industry with established applicable effluent limitations. Plaintiff, United States, alleged that these limitations had not been met. Defendant contended that the government could not maintain any action since the Administrator of the Environmental Protection Agency (EPA) had established no effluent limitations or guidelines as required by the Federal Water Pollution Control Act (FWPCA). However, plaintiff countered that the action was maintainable since section 1342(a) of the FWPCA gives the Administrator the authority to issue enforceable permits upon such conditions as the Adminstrator may determine necessary to carry out the FWPCA provisions prior to the establishment of effluent limitations. The United States District Court of Tennessee held that even through the Administrator had neither established effluent limitations or guidelines that would be applicable to the defendant, a civil action could be commenced for violation of the permit containing conditions and limitations based upon the best engineering judgment of the EPA. (Rieck-Florida)
W77-07274

UNITED STATES V DIAMOND (PERMANENT INJUNCTION DURING ADMINISTRATIVE PROCEDURES JUSTIFIED BY DEVELOPERS FILL OF MARSHLAND WITHOUT REFUSE ACT PERMIT),
6 ERC 1968-72 (S.D. Ga April 17, 1974).

Descriptors: *Georgia, *Rivers and Harbors Act, *Landfills, *Marshes, Regulation, Permits, Land development, Land forming, Navigable waters, Navigable rivers, Construction, Disposal, Water quality control, Water quality standards, Water pollution control, Water permits.
Identifiers: *Injunctive relief, *Administrative regulations, *Fill permits.

Plaintiff brought this action for a preliminary and permanent injunction against defendant land developer in connection with an unauthorized fill of marshland. Plaintiff contends that under the Rivers and Harbors Act of 1899 it is unlawful to deposit or discharge refuse of any kind in a navigable stream, that defendant placed fill in a marsh area, that some of it has washed into a navigable stream, and that the fill area is within the navigable waters of the United States as defined by interpretative regulations which have a basis in existing case law. Defendant contended that he had procured a county permit for a rubbish land fill and had sought an After-the-Fact Permit from the Corps of Engineers (Corps). The district court held the fill of the marshland was within the navigable waters of the United States, and that the action without a permit warranted a permanent injunction against further fill operations while defendant proceeded with administrtive procedures concerning his application for an 'after-the-fact' permit. The court further held that pending final determination of the application by the Corps, the court could not order removal of the fill. (Welch-Florida)
W77-07275

COMMITTEE FOR THE CONSIDERATION OF THE JONES FALLS SEWAGE SYSTEM V TRAIN (FEDERAL COMMON LAW CONCERNING WATER POLLUTION APPLICIABLE TO INTERSTATE CONTROVERSEY ONLY),
539 F2d 1006-16 (4th Cir 1976).

Descriptors: *Maryland, *Common law, *Effluents, *Governmental interrelations, *Sewage disposal, Sewage systems, Sewage, Cities, Local governments, State governments, Federal government, Legal aspects, Social aspects, Courts, Judicial decisions, Legal review, Public health, Water pollution, Wastes, Water pollution sources, Sewage effluents, Liquid wastes, Administrative agencies, Permits, *Chesapeake Bay.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Jones Falls(Md), *Patapsco River, Federal common law, Licenses, Administrative regulations, Standing(Legal).

Defendant, the Environmental Protection Agency (EPA), issued a permit to the City of Baltimore for the discharge of raw sewage into Jones Falls. Plaintiffs, area residents, attacked the issuance of the effluent permit. The court denied this, and held that since the Federal Water Pollution Control Act (FWPCA) of 1972 did not call for immediate purity of water, effluent discharge permits were permissible under the Act. Plaintiffs then attempted to envoke federal common law concerning water pollution. The court was not persuaded, holding that federal common law applied only to interstate matters, and further, that only states had standing. The instant case involved local issue and private parties. The court concluded that the FWPCA had preempted the issue of effluent discharge. Since the permit had been under the act, federal common law could not be used to revoke it. A dissenting opinion claimed that federal common law was applicable since Jones Falls constituted part of the navigable waters of the United States. (Moorhouse-Florida)
W77-07276

NUCKOLLS V LOUISIANA STATE HIGHWAY DEPARTMENT (LIABILITY FOR UNAUTHORIZED ALTERATION OF NATURAL DRAIN),
337 So2d 313-16 (La Ct App 1976).

Descriptors: *Drainage effects, *Louisiana, *Culverts, *Overflow, Legal aspects, Water law, Ditches, Highways, Roads, Drainage, Runoff, Surface runoff, Local governments, State governments, Easements, Landscaping, Drainage water, Flooding, Rain, Judicial decisions.
Identifiers: Injunctive relief, Laches, Presumptions(Legal), Servitude of drain.

Plaintiff landowner brought action against adjacent landowner, town, and state department of highways seeking injunctive relief and damages for the flooding of his property caused by defendants' unauthorized alteration of the natural drain of rain waters. In 1954 the state department of highways had built a culvert near plaintiff's property. A nearby town disposed of excess surface water in a ditch from which the waters flowed through the culvert onto plaintiff's property. Water from adjacent landowner's property had flowed onto plaintiff's land as a result of landscaping on the lot in 1955. Defendant town and department of highways claim exception of liberative prescription of two years, and defendant landowner claims a servitude of drain. The court, interpreting a Louisiana statute which requires suits for damage of private property for public purposes be brought within two years from the time damages are sustained, found plaintiff's claims as to the town and state barred. The statute precludes suit after two years from the first occurrence of any damage after the completion of the project. Thus the prescriptive period in the instant case began with the first flood in 1972, and does not run anew from each separage damage. In ruling on adjacent landowner's defense of servitude of drain, the court found that since the defendant had received no complaint from plaintiff during the ten years following the landscaping, a valid servitude was established. (Moorhouse-Florida)
W77-07277

WOOD V WOODCOCK (RIGHTS OF ADJOINING LANDOWNERS TO SEEPAGE WATER FROM JOINT IRRIGATION DITCH),
554 P2d 151-57 (Oregon 1976). 1 dwg.

Descriptors: *Oregon, *Judicial decisions, *Irrigation ditches, *Farm ponds, *Trespass, Water law, Legal aspects, Irrigation, Irrigation canals, Channels, Open channels, Drainage systems, Easements, Legal review, Boundaries(Property), Equity, Seepage, Appropriation, Culverts, Ditches, Prescriptive rights.
Identifiers: Injunctions(Prohibitory), Intentional torts, Injunctive relief, Ditch company.

Plaintiff landowner brought suit to enjoin adjoining landowner from interfering with seepage water stored by plaintiff. Defendant filed a counterclaim for trespass and sought to establish a prescriptive easement over plaintiff's land. Plaintiff and defendent are both members of a ditch company, and they are entitled to use designated amounts of water from the ditch which crosses their properties and terminates in a pond on defendant's land. Natural seepage from the ditch has accumulated in a marsh on plaintiff's property. In 1969 plaintiff applied for and received a permit to appropriate such water; thereafter he built a pond to accumulate the water, and installed equipment to facilitate its use for irrigation. Meanwhile, defendant had improved his pipeline and culvert system to channel the water naturally flowing from plaintiff's land. The Supreme Court of Oregon held that defendant had not established an easement by prescription to divert water over plaintiff's land, since he did not prove continuous and adverse use for more than ten years. The defendant was forbidden from trespassing on plaintiff's property for the purpose of increasing the supply of water. However, as a member of the ditch company, defendant had a duty to help maintain the irrigation ditch, and could enter plaintiff's land to the extent of ditch company's easement in order to insure receipt of his full allotment of water. Similarly, plaintiff was forbidden from trespassing on defendant's lands in order to capture more water, and was assessed $500 for damages. (Moorhouse-Florida)
W77-07278

GILBERT V SMITH (LOSS OF SENIOR APPROPRIATION RIGHTS THROUGH ABANDONMENT, FORFEITURE, OR ADVERSE POSSESSION),
552 P2d 1220-26 (Idaho 1976).

Descriptors: *Idaho, *Judicial decisions, *Prior appropriation, *Priorities, *Adverse possession, Appropriation, Legal aspects, Water law, Water rights, Adjudication procedure, Preferences(Water rights), Beneficial use, Diversion, Irrigation water, Legal review, Streams, Rivers, Sinks, Sumps, Pipelines.
Identifiers: *Forfeiture of water rights, *Abandonment of water rights.

Upstream landowners brought a declaratory judgment action against downstream owners who possessed senior water appropriation rights fixed by a prior judicial decree. Plaintiffs sought a judgment re-allocating appropriation rights. Defendants predecessors in interest had been awarded a priority right to a specific measurement of water from each of three tributaries of the Bear River in 1882. In 1900, plaintiffs' predecessors in interest received a priority right on two of the same tributaries. Defendant downstream users divert their water below the confluence of the three creeks. Between the point of confluence and point of diversion several sump holes and sinks reduced the water available for defendants' use. In 1973 defendant constructed a pipeline circumventing the sinks and substantially increasing his water use. For several years prior to 1973, plaintiffs had increased their diversion. The Idaho Supreme rejected plaintiffs' claims that defendants had abandoned or forfeited the prior right. Abandonment requires an intent to abandon as well as relinquishment of the right. Inability to utilize water effectively, unless absolute, will not give an upstream junior appropriator the right to interfere with a senior right, nor is it clear unequivocal evidence of intention. Statutory forfeiture requires plaintiff to prove the existence of a 5 year period during which an owner fails to apply his water right to the beneficial use for which it was appropriated. The prior decree allocating junior and senior water rights is reaffirmed. (Moorhouse-Florida)
W77-07279

CITY AND COUNTY OF HONOLULU V BENNETT (DETERMINATION OF PRIVATE OWNERSHIP RIGHTS IN OFFSHORE ISLANDS AND BEACH PARCELS),
552 P2d 1380-92 (Hawaii 1976). 1 map.

Descriptors: *Hawaii, *Recreation facilities, *Parks, *Islands, *Condemnation, Judicial decisions, Legal review, Legal aspects, Water law, Real property, Adverse possession, Local governments, State governments, Beaches, Eminent domain, Public access, Public lands.
Identifiers: *Presumptions(Legal), Jury instructions, Notice, Land titles, Deeds, Property rights, Private ownership.

City and county of Honolulu condemned for park purposes an uninhabited island and two beach front parcels. The City contended that the state owned the island by virtue of an 1850 Privy Council resolution. Defendant Bennett claimed ownership of the island and of Parcel 2 through a deed to his undisputed predecessor in interest. Defendant McAulton claimed an undivided one-half interest in Parcel 9 in conflict with Bennett's claim of sole

ownership of that parcel. The trial court directed verdict for Bennett as to ownership of the island and the jury found Bennett the sole owner of Parcel 9. On appeal, ownership of the island was affirmed. The Supreme Court of Hawaii found the Privy Council resolution inapplicable to ownership of islands, and without the force of law. While the deed is ambiguous as to whether the island itself or only the fishing rights adjacent thereto were conveyed, it is presumed that when a small offshore island is expressly named in an ambiguous clause of a sizeable grant, the intent of the grant was to include the island. As to the verdict placing ownership of Parcel 9 in defendant Bennett, the case was remanded due to improper instructions to the jury. (Moorhouse-Florida)
W77-07280

WASTEWATER AND SLUDGE CONTROL IN THE CANADIAN METAL FINISHING INDUSTRY, SEGMENT INCLUDING CHEMICAL, ELECTROLYTIC TREATMENT; ELECTROCHEMICAL MACHINING AND POLISHING; CYANIDE HARDENING,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W77-07333

STATUS REPORT ON ABATEMENT OF WATER POLLUTION FROM THE CANADIAN PETROLEUM REFINING INDUSTRY - 1975,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W77-07334

HYDROLOGY RESEARCH DIVISION, ANNUAL PROGRESS REPORTS AND SHORT RESEARCH NOTES 1975-76.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
Report Series No. 45, 1976, 90 p., 11 fig., 5 tab.

Descriptors: *Hydrology, *Research and Development, *Programs, *Projects, Regional development, *Canada.
Identifiers: Progress reports(1975-1976).

A series of brief papers and reports on various research programs in the Hydrology Research Division is presented. There are seven research areas: (1) the Maritime Research Program to investigate salt water intrusion into coastal aquifers and flow through fractured media; (2) the Subsurface Contamination Research Program to investigate the infiltration of fluid contaminants into the subsurface and their movement through the ground; (3) the Northern Hydrogeology Program to gather information on the ground water-permafrost system of northern Canada and to improve our understanding of its response to environmental disturbances; (4) the GOWN program to develop an operational computerized system for the storage, processing and retrieval of ground water data; (5) the Urban Hydrogeology Program to investigate the interrelationships between hydrogeology and human activities in an urbanizing region; (6) the Hydrogeology of Major Excavations and Impoundments to study the effects on hydrogeologic regimes of such activities as open-pit mining and mine dewatering and (7) the Interface Hydrology Program to develop, investigate and improve hydrologic simulation and forecast models. (WATDOC)
W77-07336

REPORT OF A STUDY OF CONTROL AGENCY REVENUE FEES,
Environmental Protection Agency, Washington, D.C. Office of Planning and Management.
For primary bibliographic entry see Field 5G.
W77-07435

LEGAL DECISIONS AND OPINIONS IN POLLUTION CASES,
Messenger, Lynch, Hills and Miller, Beltsville, Md.
For primary bibliographic entry see Field 5G.
W77-07436

WATER RESOURCES PLANNING AND MANAGEMENT GOALS,
Corps of Engineers, Washington, D.C. Central Reports Management Branch.
For primary bibliographic entry see Field 6B.
W77-07523

SNOW AND ICE HYDROLOGY IN THE UNITED STATES--CURRENT STATUS AND FUTURE DIRECTIONS,
National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-07565

6F. Nonstructural Alternatives

THE EVOLUTION OF APPROACHES TO FLOOD DAMAGE REDUCTION,
Oregon State Univ., Corvallis. Dept. of Geography.
K. W. Muckleston.
Journal of Soil and Water Conservation, Vol. 31, No. 2, p. 53-59, March/April 1976. 3 photo, 11 ref.

Descriptors: *Flood plain insurance, *Legislation, *Flood control, *Flood flow, *Flood plains, Flood protection, Floods, Water control, Flood damage, Flood discharge, Water management(Applied), Federal government, Flood frequency, Flood plain zoning, Flood recurrence interval, Flood stages, State governments.

America's approach to flood hazards is changing. In the past, reliance was put most heavily on large expenditures to modify and provide for post-flood aid. Today, the trend is more towards checking the expansion into 100-year floodplains, with a greater emphasis on compulsory flood insurance for those in susceptible areas. Legislative tools have been effectively used to effect this change. The Flood Diaster Protection Act of 1973 added sanctions that for all practical purposes make participation in the flood insurance program mandatory. The Water Resources Development Act of 1974 directed federal agencies to consider nonstructural alternatives when surveying, planning, or designing any project involving flood protection. The Disaster Relief Amendments of 1974 require regulation of both land use and construction as a condition for post-flood disaster loans and grants. The author suggests that certain other actions could be taken, among them requiring that planning include those areas beyond the 100-year line to reduce catastrophic losses from future floods larger than the 100-year event. (Frank-Florida)
W77-07248

EVOLUTION AND OBJECTIVES OF RIVER BASIN COMMISSIONS IN THE UNITED STATES,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
For primary bibliographic entry see Field 6E.
W77-07249

SOME SUGGESTIONS FOR THE MANAGEMENT OF INTERNATIONAL RIVER BASINS,
New Mexico Univ., Albuquerque. School of Law.
For primary bibliographic entry see Field 6E.
W77-07250

PUBLIC PARTICIPATION IN WATER RESOURCE DEVELOPMENT,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydr. lab.
For primary bibliographic entry see Field 6B.
W77-07526

6G. Ecologic Impact Of Water Development

THE ECOLOGICAL CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART I: ECOLOGICAL STUDIES,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 5C.
W77-07178

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART II. CHEMICAL STUDIES,
Bowdoin Coll., Brunswick, Maine. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-07179

THE ECOLOGICAL, CHEMICAL AND HISTOPATHOLOGICAL EVALUATION OF AN OIL SPILL SITE, PART III: HISTOPATHOLOGICAL STUDIES,
National Water Quality Lab., West Kingston, R. I.
For primary bibliographic entry see Field 5C.
W77-07180

OFFSHORE OIL AND FISHERY RESOURCES,
New York State Dept. of Environmental Conservation, Delmar. Div. of Marine and Coastal Resources.
For primary bibliographic entry see Field 5C.
W77-07195

SCIENTIFIC AND SCENIC RIVERS ACT: COMMENTARY AND MODEL STATUTE,
Natural Resources Defense Council, Washington, D.C.
R. I. Compton.
Earth Law Journal, Vol 1, No 3, p 241-55, August 1975.

Descriptors: *River systems, *Rivers, *Wildlife conservation, *International law, Wild rivers, Recreation, Aesthetics, Legislation, Environment, Ecology, Governmental interrelations, Protection, Preservation, Federal government, Federal jurisdiction.
Identifiers: *Model legislation, *Scientific and Scenic Rivers Act, International agreement.

The world's remaining unspoiled river areas are being diminished by pressures of expanding population and development. This model statute exemplifies a means whereby countries can protect for future generations the beauty and ecological values of river areas. It recommends identifying those river areas possessing unique characteristics worthy of preservation, and bringing them under the control of the national, as opposed to a local, government. The statute further provides: (1) that studies of potential additions to the river systems be conducted; (2) that river areas be protected by the statute while they are being studied for inclusion in the river system; (3) that lands to be protected and not already held by the state be acquired through purchase or donation; (4) that other agencies having jurisdiction over the river areas be reviewed by an authority responsible for executing the statute's purpose. The Act recognizes that the degree of protection given will depend upon the special attributes of an area. Finally, the Act provides guidelines for international cooperation and written agreements where

river areas include more than one nation. (Jones-Florida)
W77-07231

RULES FOR THE PROTECTION OF THE MARINE ENVIRONMENT RELATING TO TANK VESSELS CARRYING OIL IN BULK,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-07251

NUTRIENT TRANSFORMATIONS IN LOUISIANA SALT MARSH SOILS,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 5C.
W77-07319

EFFECT OF THE ASWAN HIGH DAM ON THE NILE FLOOD AND ON THE ESTUARINE AND COASTAL CIRCULATION PATTERN ALONG THE MEDITERRANEAN EGYPTIAN COAST,
Alexandria Univ. (Egypt). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-07363

MORBIDITY AND MORTALITY OF MARINE MAMMALS,
Alaska Univ., College. Inst. of Artic Biology; and Alaska Univ., College. Inst. of Marine Science.
F. H. Fay.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 43-47, November 1976. 03-5-022-56.

Descriptors: *Alaska, *Morbidity, *Mortality, *Oil pollution, *Pathology, *Baseline studies, *Resources development, *Ecological distribution, *Environmental effects, Water resources, Data collections, Mammals, Diseases.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, Kotzebue Sound, Dermatomycosis, Streptococcosis.

The coast of Kotzebue Sound from Bering Strait to Point Hope was surveyed for dead or Moribund marine mammals. A total of 166 dead marine mammals was sighted, 92 of which were old weathered remains from previous years. The findings thus far suggest that two pathologic conditions, namely dermatomycosis and streptococcosis, occur frequently enough to merit further investigation of their rate of occurrence, present impact, and potential aggravation by the stresses of oil development activities and environmental pollution. Low level infections by agents of both conditions appear to be common to all or most of the pinnipeds inhabiting the Bering and Chukchi Seas, and acute infections occur frequently enough to have been detected even in the present small samples. It is easily conceivable that a variety of stresses potentially imposed by oil development could have a synergistic effect on both of these conditions. (See also W77-06793) (Sinha-OEIS)
W77-07405

BIOLOGY OF THE HARBOR SEAL, PHOCA VITULINA RICHARDI, IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
K. Pitcher, and D. Calkins.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 48-54, November 1976. 03-5-022-69.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Mammals, Biology, Food habits, Population, Habitats.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Gulf of Alaska, Phoca vitulina richardi, *Harbor seal, Trophic relationships, Seasonal distribution.

Preliminary data from Tagidak Island indicate a late summer buildup of seals approaching 15,000 animals on September 2. The estimates of animals hauling on Tugidak from mid-May through July ranged from 3-6,000 and then progressively increased into September. Pupping began about May 25. The greatest number of ups was observed on June 19. By mid-July few pups remained on the island. Major disturbance factors observed were aircraft, both fixed wing and helicopter. During this quarter all field data were collected from Tugidak Island south of Kodiak Island. (See also W77-06793) (Sinha-OEIS)
W77-07406

TROPHIC RELATIONSHIPS AMONG ICE INHABITING PHOCID SEALS,
Alaska Dept. of Fish and Game, Fairbanks.
L. F. Lowry, and J. J. Burns.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 127-143, November 1976. 1 fig, 4 tab, 15 ref. 03-5-022-53.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Mammals.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, Pinnipedia Phoca (Pusa) hispida, Erignathus barbatus, Phoca vitulina largha, Stomach content, Trophic relationships, *Phocid seals.

The investigation of trophic relationships among ice inhabiting phocids consisted of the compilation of existing literature and unpublished data on food habits of ringed seals, bearded seals, spotted seals and ribbon seals. In addition, available informtion on distribution, abundance and natural history of potentially important prey species was gathered. The contents of seal stomachs collected during the quarter were sorted, identified and quantified. This information will be analyzed for geographical and temporal variability to prey utilization patterns as well as for species, sex and age related dietary differences. With the understanding obtained of the trophic interrelationships of ice inhabiting phocids in the Bering-Chukchi and Beaufort marine systems, the probably kinds and magnitude of effects of OCS development on this species of seals will be evaluated. (See also W77-06793) (Sinha-OEIS)
W77-07407

POPULATION ASSESSMENT, ECOLOGY AND TROPHIC RELATIONSHIPS OF STELLER SEA LIONS IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
D. G. Calkins, and K. W. Pitcher.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 149-160, November 1976. 2 tab. 03-5-022-69.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collection, *Ecological distribution, *Distribution patterns, *Environmental effects, *Water resources, Surveys, Population, Mammals.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Gulf of Alaska, Pinnipedia, *Sea lions, Trophic relationships, Geographic distribution.

A method of photo censusing was used to determine numbers and biomass of Steller sea lions in the Gulf of Alaska. Counts have been made of a total of 97 sea lion rookeries and hauling areas in March and 100 in june in which sex and age composition were established. Other objectives of the investigation were to determine patterns of animal movement, population identity, and changes in seasonal distribution. Tentative ages for 60 sea lions have been established by counting cementum annuli which is deposited on the roots of the teeth. (See also W77-06793) (Sinha-OEIS)
W77-07408

THE RELATIONSHIPS OF MARINE MAMMAL DISTRIBUTIONS, DENSITIES AND ACTIVITIES TO SEA ICE CONDITIONS,
Alaska Dept. of Fish and Game, Fairbanks.
J. J. Burns, F. H. Fay, and L. H. Shapiro.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 1. Marine Mammals, Marine Birds, p 161-163, November 1976.

Descriptors: *Alaska, *Baseline studies, *Resources development, *Data collections, *Ecological distribution, *Environmental effects, Water resources, Mammals, Sea ice, Distribution patterns, Marine animals.
Identifiers: *Outer Continental Shelf, Environmental assessment, Environmental impact, *Bering Sea, *Chukchi Sea.

The concurrent investigation of sea ice conditions and Marine mammal distribution, densities and activities includes the following task objectives: Summarization and evaluation of existing literature and available unpublished data concerning relationships of marine mammals to sea ice conditions in the study areas; development of a classification of sea ice conditions which is meaninful in terms of marine mammal habitat and can be determined directly from satellite imagery; evaluation of the physical and environmental factors prevailing in the Bering and Chukchi seas which influence the annual occurrence, dynamics and extent of these habitats; and correlation of the temporal and spatial distribution of marine mammals in the study areas to sea ice conditions. Data regarding observations of mammal occurrences, obtained through 30 June have been organized, put into approved formats and keypunched. (See also W77-06793) (Sinha-OEIS)
W77-07409

THE DISTRIBUTION, ABUNDANCE, DIVERSITY AND PRODUCTIVITY OF THE WESTERN BEAUFORT SEA BENTHOS,
Oregon State Univ., Corvallis. School of Oceanography.
A. G. Carey, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 6-38, November 1976. 2 fig, 10 tab. 03-5-022-68.

Descriptors: Water resources, *Resources development, *Baseline studies, *Biomass, *Productivity, *Environmental effects, *Alaska, Data collections, Oceanography, Benthos.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, *Environmental assessment, *Environmental impact, resource availability, Geographic distribution.

Specific objectives of this study include the continuation of studies and analyses to: describe the distribution, species composition, numerical density, biomas of the benthos in the western part of the Beaufort Sea; describe the spatial and seasonal variability of faunal distributions and abundances; describe the benthic communities present and delineate their geographical and environmental extent; describe the effect of seasons on population size and reproductivity activity of dominant species; and determine the degree of correlation of species distributions and of various bio-indices with features of the benthic environment and

oceanography of the region. One hundred and sixty-eight grab samples from five seasonal Arctic field trips are being processed at the Oregon State University benthic laboratory where one of the main goals has been final species identification. Progress has remained steady in this area of final analysis. Systematic study of polychaetes, molluscs, amphipods and bottom copepods has continued throughout the quarter. (See also W77-06825) (Sinha-OEIS)
W77-07410

A DESCRIPTION AND NUMERICAL ANALYSIS OF THE FACTORS AFFECTING THE PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
G. C. Anderson, R. K. Lam, and B. Booth.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 165-172, November 1976. 1 tab, 3 map. 03-5-022-67.

Descriptors: *Alaska, Data collections, Numerical analysis, Water resources, *Baseline studies, *Resources development, *Environmental effects, Productivity, Plankton, Phytoplankton, Temporal distribution.
Identifiers: *Outer Continental Shelf, *Gulf of Alaska, Environmental conditions, *Environmental assessment, Environmental impact.

A search was conducted to present a compilation of available baseline biological and associated physical and chemical data from the Gulf of Alaska (planktonic realm). All data were converted into OCSEAP format and entered on magnetic tape. To use the compiled data for a description of the temporal and geographic variation in phytoplankton standing stock (and species), production, and related physical and chemical factors a program was written. Results are graphically displayed. Some species display a clearly limited distribution whereas others are frequent and widely distributed. A standard run, simulating the evolution of the chlorophyll distribution in the upper 150 m of water over a period of one year, was completed for Station P. The chlorophyll distribution depends on five constant parameters and six independent variables. (See also W77-06825) (Sinha-OEIS)
W77-07411

ZOOPLANKTON AND MICRONEKTON STUDIES IN THE BERING - CHUKCHI/BEAUFORT SEAS,
Alaska Univ., College. Inst. of Marine Science.
R. T. Cooney.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 345-348, November 1976. 03-5-022-56.

Descriptors: *Alaska, Water resources, *Zooplankton, *Baseline studies, *Resources development, *Environmental effects, Distribution patterns, Data collections.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, Norton Sound, Kotzebue Sound, Micronekton, Bering Sea, Beaufort Sea, Chukchi Sea.

On-site observations documented large numbers of hydomedusae and gaddoid fishes in the nearshore waters of both Norton and Kotzebue Sounds. Also many specimens of the scyphozoans were counted and discarded from samples. the amphipod Parathemisto libellula was extremely abundant in many of the samples taken well off shore, while a marine Cladocern appeared to dominate the net zooplankton close to the beach. The nearshore zooplankton community around the periphery of Norton and Kotzebue Sounds differs in species composition and abundance from that of the waters further out over the shelf. These areas in addition to being shallower are probably 'fresher' in terms of salt content than the more open shelf regions which would be selected for a more niretic community. The presence of large jellyfish in abundance may be indicative of a restricted circulation in these areas also. (See also W77-06825) (Sinha-OEIS)
W77-07412

PHYTOPLANKTON STUDIES IN THE BERING SEA,
Alaska U Univ., College. Inst. of Marine Science.
V. Alexander.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 349-353, November 1976. 03-5-022-56.

Descriptors: *Alaska, Water resources, *Sea ice, *Baseline studies, *Resources development, *Environmental effects, Data collections, Aquatic plants, Phytoplankton.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Bering Sea, Ice pack.

The dynamics of phytoplankton populations at the edge of the retreating ice pack in the Bering Sea was studied in order to assess the significance of the ice edge in the productivity of the Bering Sea. Studies away from the ice edge were carried out to provide data for comparison. Data organization, sample processing and analysis has been undertaken. All primary productivity samples have been counted and calculated, chlorophyll samples analyzed and calculated and alkalinity titrations performd. (See also W77-06825) (Sinha-OEIS)
W77-07413

BEAUFORT SEA PLANKTON STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English, and R. A. Horner.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Quarter Ending Sept. 1976, Vol 2. Fish, Plankton, Benthos, Littoral, p 457-482, November 1976. 1 fig, 7 tab, numerous ref. 03-5-022-67-TA2 No. 4.

Descriptors: *Plankton, *Surveys, *Baseline studies, *Resources development, *Environmental effects, Water resources, *Alaska, *Data collections, Primary productivity, Bibliographies, Distribution patterns, Seasonal, Ecology.
Identifiers: *Outer Continental Shelf, *Environmental assessment, *Environmental impact, *Beaufort Sea, Biological data.

The primary objectives of this project were to determine the seasonal density distribution and environmental requirements of principal species of phytoplankton, zooplankton and ichthyoplankton, and to determine seasonal indices of phytoplankton production. The secondary objective was to summarize existing literature, unpublished data, and archived samples. A cruise aboard USCGC GLACIER from August 7 to Sept. 4, 1976 resulted in zooplankton and ichthyoplankton samples. Acoustic surveys were conducted and subsamples were taken for salinity, standing stock primary productivity and chlorophyll a determinations. The Arctic phytoplankton references have been put on computer cards and the first listings run. This is to be considered a preliminary list because corrections and additions have not been completed. (See also W77-06825) (Sinha-OEIS)
W77-07414

THE ECONOMICS OF NATURAL ENVIRONMENTS, STUDIES IN THE VALUATION OF COMMODITY AND AMENITY RESOURCES.
Resources for the Future, Inc., Washington, D. C.
J. V. Krutilla, and A. C. Fisher.
Johns Hopkins University Press, Baltimore, Md. 1975. 304 p. 11 fig., 41 tab., 249 ref.

Descriptors: *Natural resources, *Economics, *Resource allocation, *Theoretical analysis, *Value, Water policy, *Research priorities, Water allocation(Policy), Water resources development, *Evaluation, Institutional constraints, Political constraints, Administrative agencies, Optimization, Land use, Public lands, Public rights, Reclamation states, Property values, Real property, Discount rates, Risks, National parks, National wildlife refuges, Mining, Pipelines, Oil industry, Reservoirs, Research facilities, Research and development.
Identifiers: Hells Canyon dam and reservoir(Idaho and Ore), White Cloud Peaks(Idaho), Challis National Forest(Idaho), Mineral King Valley(Cal), Sequoia National Park(Cal), Prairie Wetlands Area(U.S. and Canada), Alaskan Oil Pipeline.

A book addresses valuation, allocation and management of the resourcesof natural environments, and in particular aims at describing the range of amenity resources that have not previously been included in economic analyses even though they have been long recognized in public policies providing for such services as national parks, wildlife reufges and wilderness areas. The two-part volume covers institutional and theoretical considerations and provides five case studies in which analyses are applied. Chapters on theory include: (1) managing natural environments; (2) externalities, property rights, and valuation of resources on the public lands; (3) irreversibility and the optimal use of natural environments; (4) further analysis of irreversibility: Discounting, intergenerational transfers and uncertainty. Case studies include: (1) the Hells Canyon dam and reservoir on the Snake River(Idaho and Oregon); (2) mining activities in the White Cloud Peaks area of the Challis National Forest near Sun Valley, Idaho; (3) efforts to incorporate Mineral King Valley in the Sierra Nevad a Mountains (Calif.) into the surrounding Sequoia National Park; (4) the allocation of prairie wetlands in the north-central U.S. and neighboring provinces of Canada for breeding habitats of migratory waterfowl; and (5) environmental consequences and alternatives for the trans-Alaska oil pipeline. A summary chapter includes recommendations for establishing a network of regional centers of natural resources research focusing on various aspects of public land management, with each center to be assigned a specific area of research competence. (Harris-Wisconsin).
W77-07437

THE ENVIRONMENTALLY CONCERNED CITIZEN: SOME CORRELATES,
Connecticut Univ., Storrs.
L. R. Tucker.
Pennsylvania State Univ., Center for the Study of Environmental Policy Working Paper 23 (undated). 8 tab., 46 ref.

Descriptors: *Surveys, *Social participation, *Social values, Decision making, Psychological aspects, Motivation, Sampling, Statistical methods, Data collections, Environment, Environmental effects, Pennsylvania.
Identifiers: *Public opinion sampling, *Citizen participation, *Environmental protection, *Sierra Club, *Audubon Society.

Examination is made of the relationship between measures of internal-external control, social responsibility, social class, age and income, and environmental responsibility. To assess these relationships, a survey of 179 female homemakers in a central Pennsylvania shopping center was made of opinions and related actions in connection with environmentally-related behavior. Thirty-four homemakers were recruited through membership in the local Sierra Club and Audubon Society and 145 general-population subjects were solicited

through local media. Responses were obtained from 166 women: 27 club members and 139 general-population members. Hypotheses tested by the survey were: (1) that members of the Sierra Club and/or Audubon Society exhibit more positive environmentally responsible attitudes and behaviors than the members of the general population; and (2) that members of these groups show higher social responsibility scale scores and social class standing and income levels and lower internal-external control scale scores and age than the members of the general population. Data collection was a two-stage process. In the first stage, questionnaires were administered which contained personality and attitude scales and demographic and self-report behavior items. In the second phase, the women were given choices of supermarket gifts: soft drinks in cans or returnable bottles, low-phosphate detergent vs. other detergents. Correlates were tested through statistical analysis techniques.(Harris-Wisconsin).
W77-07438

MODELING MULTIPLE-USE IN NATURAL AREAS: PART I -- THE BASIC FORMULATION,
Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 6A.
W77-07530

DECISION-MAKING FOR ENVIRONMENTAL RESOURCES MANAGEMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. D. Bradley.
Journal of Environmental Management, Vol. 1, No. 3, p 289-302, July 1973. 30 ref.

Descriptors: *Environment, *Management, *Model studies, *Decision making, Economics, Water resources, Water policy, Political aspects, Social aspects, Effects, Ecology.
Identifiers: Mixed scanning, Incremental model, Information strategy, Strategic choice, Ecological integration.

In a world of accelerating scientific and technological advance, of rapid social and economic appraisal and reappraisal of resources, increasingly complex choices have to be promptly made. The cost of faulty decisions weighs heavily, however, as society becomes increasingly concerned with broad environmental side effects, especially where these effects may be irreversible. Focus upon the forces and resistances acting upon the decision-makers when questions of resource management are judged is needed to understand more completely the factors that contribute to decisions which ultimately reflect changes in the landscape, and which affect future public use and enjoyment of the environment. Discussed are four general decision-making approaches for environmental resource management: (1) the rational model, which uses a direct approach and eliminates the need for ideology in decision making; (2) the incremental model, which is more political in nature--it considers a few changing policies which differ only incrementally from existing policies and attempts to redefine the ends-means adjustments by way of feedback from various publics; (3) mixed scanning,which seeks to avoid the most serious problems of both the overly-rationalistic model and the excessively pragmatic model; and (4) the ecological model, an integrative decision-making model using long- and short-run time spans and micro- and macro-spans of analysis. The strengths and weaknesses of these approaches are described. Discussed also are the formation of goals, strategic choice, information strategy, and ecological integration. (Bell-Cornell)
W77-07542

POWER PLANT SITE EVALUATION: THE CASE OF THE SHARON PLANT IN ISRAEL,
Technion - Israel Inst. of Tech., Haifa. Center for Urban and Regional Studies.
M. Hill, and R. Alterman.
Journal of Environmental Management, Vol. 2, No. 2, p 179-196, April 1974. 1 fig, 5 tab, 13 ref.

Descriptors: *Powerplants, *Sites, *Evaluation, *Methodology, Pollution abatement, Industries, Environmental effects, Planning, Decision making, Cost-benefit analysis, Coasts, Cooling water, Sea water, Constraints, System analysis.
Identifiers: *Israel, Mediterranean coastal strip, Goals achievement matrix, Criteria evaluation matrix.

Site selection for polluting industries presents planners and decision makers with a difficult problem. Even more complex is the problem of locating powerplants because they affect the environment in several different ways, not all of which can be expressed by a common measure. It is therefore necessary to compare sites not only aspect by aspect, but also in terms of making some aggregative evaluation. This paper reviews several prevalent methods of evaluation, such as cost-benefit analysis, the goals-achievement matrix, and the indices method. Presented is the method finally selected by the research team. The method, a modified version of the goals-achievement matrix, is called the criteria evaluation matrix and is described herein. It was felt to be most suitable due to the limited problem of selecting one of two given sites and in view of the limiting terms of reference. This research method is based on separate but coordinated work on the part of each subteam of experts, with each subteam formulating its own conclusions based on its subject area. The topics selected for study are: land use planning, landscape and ecology, economic considerations, distribution of pollutants and their effect on health, and legal-administrative problems in implementation. The comprehensive conclusions were formulated after the conclusion of each subteam was discussed by the full team, in light of additional considerations that were regarded as cutting across all the subject areas. These considerations were: reversibility and substitutability, existing versus planned uses, and possible effects of new technologies for pollution control. (Bell-Cornell)
W77-07546

LITERATURE ON ENVIRONMENTAL PROTECTION, MANAGEMENT AND HYGIENE IN SWEDEN 1952-1971: BIBLIOGRAPHY AND ANALYSIS, (IN SWEDISH),
Y. Dahlstrem-Ekbohm.
Vaextekol Stud 6, p 1-119, 1975.

Descriptors: *Bibliographies, *Ecology, *Environmental effects, *Environmental control, Water pollution, Air pollution, Sewage, Public health, Toxicity, Waste water treatment.
Identifiers: *Sweden.

Subject headings are noise; ecology, biotope and landscape management, protection and management, of wild life; outdoor recreation, planning; counteracting of air pollution; environmental poisons; environmental protection and management; general, administrative and legal aspects; environmental hygiene, sewge treatment, waste; and management of water resources. The development of environmental protection and management in Sweden is summarized. A passive protection of nature from a scientific and cultural point of view gave way to an increasing number of active measures to protect and preserve nature, including the beauty of the landscape. Greater attention began to be given to the need for leisure and outdoor recreational facilities and greater emphasis was placed on recreation along with protecting and managing the landscape. With the development of ecology, there grew an awareness of the limited nature of the earth's natural resources, the dangers of waste and its uncontrolled dispersal, the dangers of pesticides, and the part played by man in the ecosystem, leading to an increased sense of societal responsibility toward the environment.--Copyright 1977, Biological Abstracts, Inc.
W77-07586

7. RESOURCES DATA

7A. Network Design

MAXIMUM 5-MINUTE AND HOURLY RAINFALLS ON METROMEX NETWORK, 1971-1975,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W77-07374

THE ECONOMIC BASIS OF RESOURCE INFORMATION SYSTEMS: THE CASE OF STREAMFLOW DATA NETWORK DESIGN,
Geological Survey, Reston, Va. Geologic Div.
E. D. Attanasi, and M. R. Karlinger.
Water Resources Research, Vol. 13, No. 2, p 273-280, April 1977. 2 fig, 2 tab, 19 ref, 1 append.

Descriptors: *Streamflow, *Networks, *Design, *Optimization, Economics, *Data collections, Resource allocation(Policy), Hydrologic data, Input-output analysis, Natural resources, Constraints, Methodology, Surface waters, Costs, Decision making, Probability, Equations, Mathematical models, Systems analysis.
Identifiers: *Information systems, Cost minimization, Production function, Loss function, Parameter uncertainty, Utility function.

A general method for the economic design of natural resource information systems is presented for a certain class of natural phenomena. The system design is determined by the interaction of the technical input-output relationship, e.g., the production function, the set of resource constraints, and an economic loss function defined in terms of parameter uncertainty. An application of the proposed method to streamflow network design is presented. The least-cost system design configuration is based on the economically relevant system inputs and is determined by the relationship between input costs (including opportunity cost of time) and the value of information defined in a decision theoretic sense. Results of this analysis indicate that the method is fairly robust with respect to the assumptions. Observations are made which suggest extensions to flood measurement networks, long-term precipitation networks, and seismic observation network design. (Bell-Cornell)
W77-07534

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 1, TEXT OF REPORT,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W77-07566

FINAL REPORT ON THE PYRAMID LAKE PILOT PROJECT, 1970-1975, VOLUME 2, APPENDICES,
Nevada Univ. System, Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W77-07567

7B. Data Acquisition

AUTOMATIC MONITORING OF SOIL MOISTURE CONDITIONS IN A HILLSLOPE SPUR AND HOLLOW,
Bristol Univ., (England). Dept. of Geography.

For primary bibliographic entry see Field 2G.
W77-07146

A LIGHT-WEIGHT AND CHEAP DEPTH SAMPLER,
Teesside Polytechnic, Middlesborough (England).
For primary bibliographic entry see Field 5A.
W77-07155

A NEW METHOD FOR PHYSICAL LIMNOLOGY--TRITIUM-HELIUM-3 AGES--RESULTS FOR LAKE ERIE, HURON, AND ONTARIO,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2H.
W77-07168

AN OXYGEN-ISOTOPE CLIMATIC RECORD FROM THE DEVON ISLAND ICE CAP, ARCTIC CANADA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
For primary bibliographic entry see Field 2C.
W77-07175

LABORATORY APPARATUS FOR PROVIDING DIEL TEMPERATURE REGIMES FOR AQUATIC ANIMALS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-07188

SURBER SAMPLING IN DEEP WATER FOR BOTTOM ORGANISMS,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
R. H. Gray, and D. A. Neitzel.
The Progressive Fish-Culturist, vol. 38, no. 3, p. 142-143, 1976. 1 fig., 16 ref.

Descriptors: *Bottom sampling, Rivers, Research equipment, *Sampling, On-site data collections, River beds, River flow, Scuba diving, Benthos, Aquatic life, *Methodology.
Identifiers: *Surber sampler.

A thick-walled canvas bag with a drawstring is added to the standard Surber sampler for use in deep, fast-flowing rivers. One SCUBA diver stabilizes the sampler and one collects the sample by placing gravel and rocks in the canvas bag. The net and bag catch any dislodged organisms. (Katz)
W77-07199

A HAND-OPERATED IN SITU WATER SAMPLER,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-07200

EVALUATION OF TWO METHODS FOR CALCULATING FRESHWATER ZOOPLANKTON PRODUCTION, (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
I. N. Andronikova.
Gidrobiol Zh 12(1), p 71-75, 1976.

Descriptors: *Zooplankton, *Productivity, Methodology, *Copepods, *Crustaceans, Reproduction, Respiration, Growth rates.
Identifiers: Eudiaptomus, Mesocyclops.

Comparison of graphic (weight gain) and physiological respiration) methods of production calculation showed that with K2 (coefficient of food assimilation) = 0.4 used in the 2nd method of calculation the production values, especially for Copepoda, are 4-5 times as high as those obtained by the 1st method. The greatest convergence of the values is observed when K2 = 0.2 for Eudiaptomus, K2 = 0.15 for Mesocyclops and K2 = 0.35 for Cladocera. When using the physiological method for the Copepoda population, adult individuals should not be included in the calculation, since their somatic growth has already stopped. Production owing to generative growth, or reproduction, should be determined separately and added to the production calculated by respiration for that part of the population which gives gain in weight.--Copyright 1976, Biological Abstracts, Inc.
W77-07228

ACOUSTIC MEASUREMENT OF SEDIMENT TRANSPORT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W77-07338

HYDROGEOLOGICAL APPLICATIONS OF EARTH RESOURCES TECHNOLOGY SATELLITE LANDSAT 1 IMAGERY,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
J. E. Charron.
Scientific Series No. 62, (English and French), 1976, 9 p., 9 fig., 5 ref.

Descriptors: *Remote sensing, Hydrology, *Geography, *Land resources, *Satellites, Technology, Groundwater recharge, Artesian wells, Freshwater, Mapping, *Canada.
Identifiers: *ERTS, *LANDSAT 1, Imagery, Manitoba, Ottawa, Ontario, Montreal, Quebec, Winnipeg.

A correlation of LANDSAT I imagery with various hydrogeological and surficial geology features in the Winnipeg area, Manitoba, and the Ottawa (Ontario)-Montreal (Quebec) area of Canada is presented. The study includes the identification of groundwater recharge and discharge areas and artesian zones; areas of freshwater discharge into surface-water bodies; and the identification and mapping of various types of surficial deposits. (WATDOC)
W77-07339

USE OF AERIAL REMOTE SENSORS TO MONITOR DREDGING PROJECTS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07344

REAERATION-COEFFICIENT MEASUREMENTS OF 10 SMALL STREAMS IN WISCONSIN USING RADIOACTIVE TRACERS--WITH A SECTION ON THE ENERGY-DISSIPATION MODEL.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-07496

VALUE OF LANDSAT IN URBAN WATER RESOURCES PLANNING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-07527

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2H.
W77-07549

7C. Evaluation, Processing and Publication

MISSOURI RIVER POWER CURVE REGRESSION EQUATIONS,
Missouri Univ., St. Louis. Dept. of Geology.
For primary bibliographic entry see Field 2E.
W77-07152

DIGITAL RAINGAGE RECORDER,
Siena Coll., Loudonville, N.Y. Dept. of Physics.
For primary bibliographic entry see Field 2B.
W77-07172

PHYSICAL ENVIRONMENT ATLAS OF COASTAL ALABAMA,
Alabama Univ. System, Dauphine Island. Marine Science Programs; and Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss.
For primary bibliographic entry see Field 2L.
W77-07322

HYDROGRAPHIC PROPERTIES, MESA NEW YORK BIGHT ATLAS MONOGRAPH 1,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2L.
W77-07328

OBSERVATIONS ON BACTERIOLOGICAL CONDITIONS IN THE UPPER GREAT LAKES 1968-1974,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W77-07340

MATHEMATICAL MODELING OF SEDIMENTATION TRANSIENTS IN SAND-BED CHANNELS,
Colorado State Univ., Fort Collins, Engineering Research Center.
For primary bibliographic entry see Field 2J.
W77-07354

MAXIMUM 5-MINUTE AND HOURLY RAINFALLS ON METROMEX NETWORK, 1971-1975,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W77-07374

PRELIMINARY MAPS SHOWING GROUNDWATER RESOURCES IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Tucson, Ariz. Water Resources Div.
S. G. Brown.
Available from Branch of Distribution, USGS--Box 25286, Federal Center Denver, Colo 80225, price $5.25. Hydrologic Investigations Atlas HA-542, 1976. 3 sheets, 87 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Mapping, *Colorado River basin, Arizona, Nevada, New Mexico, Utah, Geologic mapping, Subsurface mapping, Aquifer characteristics, Hydraulic conductivity, Hydrogeology, Groundwater movement, Aquifer systems, Pumping, Water yield, Water supply, Groundwater recharge, *Maps.
Identifiers: *Lower Colorado River Region.

This atlas was prepared to meet the need for information on the areal distribution, quantity, and availability of ground water in the lower Colorado River region, an area of about 140,000 square miles in parts of Arizona, Nevada, New Mexico, and Utah. The lower Colorado River region is divided into three water provinces--the Basin and

Range lowlands province, the Plateau uplands province, and the Central highlands province. The annual precipitation in the region ranges from 3 inches near Yuma, Ariz., to as much as 35 inches on the highest peaks, such as those of the Chiricahua Mountains in Arizona. The precipitation in the lowlands ranges from about 10 to 12 inches per year. In the Basin and Range lowlands the hydraulic conductivity of the aquifers can be as much as 130 feet per day. In the Plateau uplands province most of the groundwater occurs in three multiple-aquifer systems. For the most part, the multiple-aquifer systems do not transmit water readily, and the hydraulic conductivity generally is less than 1.3 feet per day. The Central highlands province is a mountainous area that separates the Plateau uplands from the Basin and Range lowlands in most of the lower Colorado region. The principal discharge area for ground water in the highlands occurs along the base of the Mogollon Rim. (Woodard-USGS)
W77-07478

GROUND-WATER LEVELS IN MASSACHUSETTS, 1936-74,
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07485

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1973-77,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-07486

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, Calif. Water Resources Div.
Geological Survey Water-Data Report CA-75-1, December 1976. 548 p, 6 fig, 5 tab, 34 ref.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Flow rates, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling, Sites, Water levels, Water analysis.
Identifiers: *Southern California.

Volume 1 of water resources data for the 1975 water year for California consist of records of stage, discharge, and water quality of stream; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 248 gaging stations; stage-only record for 1 gaging station; stage and contents for 21 lakes and reservoirs; water quality for 57 stations and 4 wells; water levels for 30 observation wells. Also included are 14 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W77-07491

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1975--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, Calif. Water Resources Div.
Geological Survey Water-Data Report CA-75-2, December 1976. 515 p, 3 fig, 5 tab, 34 ref.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *California, Gaging stations, Streamflow, Flow rates, Sediments, Lakes, Reservoirs, Sampling, Sites, Chemical analysis, Water temperature, Water levels.
Identifiers: *Pacific slope basins(Calif).

Volume 2 of water resources data for the 1975 water year for California consist of records of stage, discharge, and water quality of streams and wells; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 150 gaging stations; stage and contents for 20 lakes and reservoirs; water quality for 106 stations and 15 wells, water levels for 27 observation wells. Also included are 17 crest-stage partial-record stations and 2 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W77-07492

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70--PART 15. ALASKA.
Geological Survey, Reston, Va. Water Resources Div.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202 Price $4.00. Water-Supply Paper 2136, 1976. 428 p, 1 fig.

Descriptors: *Hydrologic data, *Surface waters, *Streamflow, *Lakes, *Alaska, Basic data collections, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Average flow, Resevoirs.
Identifiers: Maximum discharges, Minimum discharges, Reservoir content.

This report is one of a series of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in Alaska. This report is one of the second series of water-supply papers to be published on a 5-year basis. The first series covered the 5-year period October 1, 1960, to September 30, 1965. This series covers the period October 1, 1965, to September 30, 1970. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. (Woodard-USGS)
W77-07493

SYMAP COMPUTER PROJECTIONS OF SUMMER ZOOPLANKTON POPULATIONS IN VAN LAKE, MONTANA,
W. A. Zemko, and P. A. Buscemi.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 850-855, 1975. 8 fig., 5 ref.

Descriptors: *Mapping, *Computer programs, *Zooplankton, Distribution, Water temperature, *Montana, Phytoplankton, Maps, Lakes.
Identifiers: SYMAP computer program, *Van Lake(Mont).

Symap, a computer program for producing maps which graphically depict spatially-arranged data, was used to examine distribution boundaries of summer zooplankton populations in Van Lake, Montana. Maps for total Copepoda, Cladocera, and Ceratium hirundinella were constructed using quantitative data collected at 1 m intervals from surface to bottom in a littoral and limnetic area. Maps of temperature were also constructed for comparison. Data values were divided, into ten equal ranges by the computer and the location of each range was plotted on a vertical profile outline of the lake along a 350 m long transect. Symap projections indicated that zooplankton distribution in this lake is linked to temperature. The boundaries indicated by Symap profiles for temperature are clearly reproduced when profiles for qualitative zooplankton and phytoplankton are constructed. Symap profiles can be constructed to conform to any outline and data can be modified before insertion to the package, or the program can be changed to accommodate raw data. A series of projections can be produced by simply substituting data values, allowing comparison of seemingly unrelated parameters. Combinations of standard computer characters are used to display a scale of tone from black to white. The limited number of sampling points required to produce a workable projection of a lake environment emphasizes Symap's efficiency. (Auen-Wisconsin)
W77-07511

CALCULATION OF CALCIUM CARBONATE-CARBON DIOXIDE EQUILIBRIUM IN WATER AND MIXTURES OF WATER,
For primary bibliographic entry see Field 5A.
W77-07513

TEST OF LANDSAT-BASED URBAN HYDROLOGIC MODELING,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W77-07528

SATELLITE OBSERVATIONS OF WATER QUALITY,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-07554

8. ENGINEERING WORKS

8A. Structures

DESIGN OF GRAVITY DAMS, DESIGN MNUAL FOR CONCRETE GRAVITY DAMS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. A Water Resources Technical Publication, Denver, Colorado, 1976. 584 p.

Descriptors: *Concrete dams, *Dam design, *Spillways, *Dam foundations, *Analytical techniques, Hydraulic structures, Design data, Design criteria, Hydraulics, Outlet works, Foundation investigations, Concretes, Concrete control, Analysis, Gravity dams, Structural analysis, Diversion, Ecology, Environmental effects, Hydraulic design, Inflow, Flood forecasting, Specifications, Streamflow, Floods, Hydrology.

Instructions, examples, procedures, and standards were presented for use in the design of concrete gravity dams. The information is intended to serve as a guide to sound engineering practices and to provide the technically trained, qualified design engineer with specialized and technical information that can be readily used in the design of concrete gravity dams. Discussions in this manual were limited to dams on rock foundations and to dams more than 50 ft high. Dams less than 50 ft high were covered in 'Design of Small Dams.' Subjects discussed in detail include design considerations, design data and criteria, layout and analysis, river diversion, foundation treatment, temperature control of concrete, joints in structures, spillways,

outlet works and power outlets, galleries and adits, miscellaneous appurtenances, structural behavior measurements, concrete construction, and ecological and environmental considerations. The manual should be of service to all concerned with the planning and designing of water storage projects, but it cannot relieve the agency or person using it of the responsibility for a safe and adequate design. The limitations stated in the design procedures should be heeded. (See also W74-01058 thru W74-01070) (Humphreys-ISWS)
W77-07151

RECLAMATION RESEARCH IN THE SEVENTIES, SECOND PROGRESS REPORT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
Also available from Sups. Doc, U.S. Government Printing Office, Washington, D.C. 20402, for $2.50. Water Resources Technical Publication, Research Report No. 28, (1977), 102 p.

Descriptors: *Weather modification, Water resources, Energy, Environment, Water quality, *Electric power, Instrumentation, *Geothermal studies, Pumped-storage, *Water conservation, Management, Land classification, Ecology, Structural behavior, Soil mechanics, Rock mechanics, Concrete technology, Materials testing, Rapid excavation, *Research and development.
Identifiers: *Energy research.

This report summarizes the Bureau's congressionally funded water resources research programs, including the major research activities of the seven regional offices of the Bureau and those of the Engineering and Research (E&R) Center in Denver. The material, with the exception of Project Skywater and Energy Research and Development, is organized and presented under five subject categories established by the Committee for Water Resources Research (COWRR), i.e., Water Supply Augmentation and Conservation, Water Quantity Management and Control, Water Quality Management and Protection, Water Resources Planning, and Engineering Works. Some of the projects discussed are long-term studies of physical problems facing all water resources development organizations; and many are new studies of social, economic, ecological, and environmental concepts. This report reveals a significant increase in research on environmental impacts of projected or existing projects, new emphasis on energy, and greater attention to social and sociological factors related to resources development. Certain continuing routine studies not listed here may be found in previous reports covering the years 1965, 1966, 1967, 1968, 1969 and 1974. (Bur Reclam)
W77-07600

8B. Hydraulics

DESIGN OF GRAVITY DAMS, DESIGN MNUAL FOR CONCRETE GRAVITY DAMS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07151

FREE FLOW IMMEDIATELY BELOW SLUICE GATES,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
N. Rajaratnam.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12867, p 345-351, April 1977. 7 fig, 1 tab 9 ref, 2 append.

Descriptors: *Boundary layers, *Flow, *Sluice gate, Gate control, Gates, Open channel flow, Sluices, Hydraulics, Laboratory tests, Channels, Profiles, Pressure.
Identifiers: *Contraction, Water surface profiles, Coefficient of contraction, Pressure field, Free flow.

Based on the results of an experimental study, it was found that the water surface profiles immediately below sluice gates in rectangular channels are similar. The coefficient of contraction was found to be larger than the theoretically predicted value, and it is not possible to attribute this difference to boundary layer effects alone. The pressure field in the converging flow was measured, and the dimensionless excess pressure on the bed was correlated with the dimensionless longitudinal distance from the gate. (Lee-ISWS)
W77-07161

LOCATION OF FREE SURFACE IN POROUS MEDIA,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W77-07162

HYDRAULIC JUMPS AND WAVES AT ABRUPT DROPS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
N. Rajaratnam, and N. V. Ortiz.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12869, p 381-394, April 1977. 14 fig, 2 tab, 11 ref, 2 append.

Descriptors: *Drops(Structures), *Flow, *Hydraulic jump, Open channel flow, Open channels, Shear stress, Turbulent flow, Waves(Water), Tail water, Hydraulics.
Identifiers: Abrupt drops, Tailwater depth, Bed shear, Captive eddy.

Experimental results on the structure of the mean flow in B-jumps and waves formed at abrupt drops in open channels for a wide range of the supercritical Froude number and relative drop height were presented. In the B-jump, the supercritical stream undergoes diffusion; firstly as a curved free jet sandwiched between the captive eddy on the bottom and the surface roller on the top, and secondly as a reattached plane wall jet with the surface roller on its top. The bed shear stress in the downstream channel was measured and well correlated along with the variation of the maximum velocity. In the wave, it was found: (1) that the supercritical stream is deflected by the tailwater back-pressure, and (2) that the deflected stream behaves like a curved surface jet until it plunges into the tailwater. The decay of the maximum velocity in the wave was found to be generally faster than that in the classical jump and the B-jump. (Lee-ISWS)
W77-07163

DESIGN CRITERIA FOR HYDROLOGIC EXTREMES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
V. T. Chow, and N. Takase.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY4, Proceedings Paper 12886, p 425-436, April 1977. 4 fig, 4 tab, 11 ref, 2 append.

Descriptors: *Design criteria, *Floods, *Model studies, *Illinois, Hydrology, Water resources, Probability, Statistical models, Statistical methods, Rivers, Equations, Monte Carlo method.
Identifiers: Recurrence interval, Water resources system, Independent random variables.

Hydrologic extremes, such as floods and low flows, were treated as independent random variables. Accordingly, probabilistic models were derived for two approaches of adopting hydrologic extremes as design criteria in water resources project planning. One approach was to use the hydrologic event of a given occurrence interval, and the other was to use the extreme flood observed in the record. The models were verified agreeably by the flood data of 10 Illinois rivers. Both models gave essentially the same results when the period of design was less than 1/10 of the recurrence interval and the length of the record. Also, by the Monte Carlo method, synthetic hydrologic extremes were generated by a time-series model for use in water resources systems analysis. (Roberts-ISWS)
W77-07165

THE CABLE TOOL DRILLING MACHINE, PART III,
For primary bibliographic entry see Field 8C.
W77-07286

THE CABLE TOOL DRILLING MACHINE, PART IV,
For primary bibliographic entry see Field 8C.
W77-07287

DEEP WELLS FOR DEWATERING OFFER REAL ADVANTAGES, PART I.
The Johnson Drillers Journal, Vol. 49, No. 1, p 1-4, 11, January-February, 1977. 2 fig.

Descriptors: *Dewatering, *Deep wells, Wellpoints, Excavation, Drawdown, Specific yield, Transmissivity, Pumping, Soils.
Identifiers: Boyle's Law.

Because deep wells can lower water tables up to 4 times more than commonly used single-stage wellpoint systems, they are frequently more effective in dewatering soil for excavation. Though of limited use in trenching operations and other projects requiring mobility, deep wells are very economical in many cases and are capable of relieving artesian pressure below digging level. Wells for dewatering, unlike production wells, are designed to provide maximum drawdown. The combined effect of a group of dewatering wells can be estimated by graphic or computer superimposition of the effects of single wells; since transmissivity of water table aquifers decreases with the reduction of saturated thickness during pumping, the actual amount of pumpage will usually be lower. It is common practice to install submersible or line-shaft turbine pumps with air-tight seals between the pump column pipe and the well casing in order to maintain the pumping level in the well while increasing drawdown. Vacuum and additional drawdown produced by such sealing can be estimated using a variant of Boyle's Law. (Eberle-NWWA)
W77-07294

CATHODIC PROJECTION OF BOREHOLE CASING,
For primary bibliographic entry see Field 8G.
W77-07297

NEW RIG CONCEPT USES CONTINUOUS DRILL STRING.
For primary bibliographic entry see Field 8G.
W77-07298

NEW LOST CIRCULATION REMEDY IS EASY TO USE.
For primary bibliographic entry see Field 8G.
W77-07299

PHYSICAL MODELING OF COMBINED FORCED AND NATURAL CONVECTION IN WET GEOTHERMAL FORMATIONS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4B.
W77-07303

MATHEMATICAL MODELING OF SEDIMENTATION TRANSIENTS IN SAND-BED CHANNELS,
Colorado State Univ., Fort Collins, Engineering Research Center.
For primary bibliographic entry see Field 2J.
W77-07354

THE RESPONSE OF AN ESTUARY TO THE CLOSURE OF A MOBILE BARRIER; RICHMOND BARRIER ON THE UPPER THAMES ESTUARY,
Institute of Oceanographic Sciences, Birkenhead (England).
For primary bibliographic entry see Field 2L.
W77-07366

PREDICTING CHANGES IN TIDAL REGIME: THE OPEN BOUNDARY PROBLEM,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
C. Garrett, and D. Greenberg.
Journal of Physical Oceanography, Vol 7, No 2, p 171-181, March 1977. 4 fig, 2 tab, 23 ref, 1 append.

Descriptors: *Tides, *Tidal powerplants, *Model studies, *Mathematical models, Water levels, Tidal waters, Tidal energy, Bays, Gulfs, Continental shelf, Estuaries, Flow, Mass transfer, Barriers, Oceanography.
Identifiers: *Bay of Fundy, *Gulf of Maine.

Attempts to predict the impact on a tidal regime of large engineering structures generally are based on the use of a numerical model which is calibrated to reproduce the natural tidal regime and then rerun with the structures in place. Usually it is assumed that the 'input' tide at the open boundary is unchanged by the structures, though this is clearly wrong in principle. It was shown how errors in this procedure can be corrected, or at least estimated, for using output from the numerical model and estimates of the impedance of the exterior ocean. The ocean impedance can be expressed as an infinite series in terms of the normal modes of the ocean, with some terms allowing for near-resonant enhancement of particular modes, and the infinite tail corresponding to a local source-like behavior which can be estimated independently. Application of the technique to the problem of predicting the impact of Fundy tidal power suggests that any predicted change may be uncertain to about plus or minus 25% of the change in mass flux across the open boundary. This uncertainty could amount to plus or minus 4% of the tidal range for a large tidal power development. It is clear that numerical models used in this type of problem should generally extend to the edge of the continental shelf. The role of side boundaries from the coast to the edge of the shelf is uncertain, although in the Fundy problem there is little mass flux across them so that they appear not to be important. (Sims-ISWS)
W77-07370

MANNING N AND THE OVERLAND FLOW EQUATION,
Agricultural Research Service, Stillwater, Okla.
For primary bibliographic entry see Field 2E.
W77-07371

REDUCING POWER CONSUMPTION IN IRRIGATION SYSTEMS WITH THE AID OF A MATHEMATICAL MODEL FOR PIPE DIMENSIONING,
Academia de Studii Economice, Bucharest (Rumania). Dept. of Economic Cybernetics.
For primary bibliographic entry see Field 3F.
W77-07547

RECLAMATION RESEARCH IN THE SEVENTIES, SECOND PROGRESS REPORT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07600

8C. Hydraulic Machinery

THE CABLE TOOL DRILLING MACHINE, PART III,
Ground Water Age, Vol. 11, No. 4, p 19-22, December, 1976. 5 figs.

Descriptors: *Drilling equipment, *Drilling, Well casings.
Identifiers: *Cable tool drilling equipment, *Bailing.

Preparation for drilling using the cable tool machine consists of several steps. Preliminary steps include obtaining a sufficient water supply for the drilling, setting the rig, attaching and spooling the wire rope drums, extending the derrick, and stringing the tools. After this, the drilling process commences; selection of proper stroke length and operating speed are essential at this point to ensure proper drilling progres. As mud and water accumulate in the borehole a certain amount of the fluid will need to be bailed out depending on the character of the formation being penetrated. Close monitoring of the bailing process can alert the driller to problems with the hole that should be corrected before drilling further. Pipe is driven into the hole by means of drive clamps and usually a drive head attached to the sting of drilling tools. Bailing and clean-out operations are often necessary as the driving process slows down. Great care must be taken that the first 40 to 60 feet of casing go in absolutely straight. (See also W77-07287) (Eberle-NWWA)
W77-07286

THE CABLE TOOL DRILLING MACHINE, PART IV,
Ground Water Age, Vol. 11, No. 6, p 23-25, February, 1977. 3 figs, 1 tab.

Descriptors: *Drilling equipment, *Drilling, *Well casings.
Identifiers: *Cable tool drilling equipment, Hollow rod drilling, Jetting systems.

Because each type of material that a driller works presents its own set of problems, it is important for the driller to know how to handle casing under varying conditions. In soft clays and in sand and gravel formations, casing is frequently driven ahead of the hole. This is not the case with hard clays, hard pan formations (which may require blasting to open up the hole when obstacles are encountered), or drilling in bedrock. Drilling in quicksand is especially difficult, and sometimes can only be accomplished by filling the bottom of the well with Portland cement or by keeping the drill hole full of water. Cable tool rigs are sometimes used with hollow rod or jetting system attachments. Hollow rod bits are equipped with a check valve and operate by allowing the drill pipe to fill with fluid and cuttings with each successive stroke. Jetting is somewhat the reverse process; fluid is pumped down through the drill pipe, the cuttings flowing up through the space between the drill pipe and casing. (See also W77-07286) (Eberle-NWWA)
W77-07287

THE CHIEF DRILLER'S REPORT ON JCCIP,
Christian Organization for Relief and Rehabilitation, New York.
B. Eaton.
Agricultural Development Agencies in Bangladesh, Dhanmandi, Dacca, June, 1976. 29 p. TKs. 3.00.

Descriptors: *Drilling, *Drilling equipment, *Well screens, *Plastic pipes, *Irrigation wells, *Pumps, Well casings, Drilling fluids, Bearings.
Identifiers: *Well development, *Propeller pumps, Bangladesh, Gravel packing, Jetting, Bailing, Over pumping, Pump drive systems, Bamboo.

Research performed by the Joint CORR-CRS (Catholic Relief Services) Irrigation Project (JCCIP) in Bangdladesh between 1973 and 1976 has demonstrated moderate success with labor-intensive drilling and well development methods. Manual adaptations of cable-tool techniques such as 'manual percussion,' jetting, and hollow rod methods were possible because of unconsolidated alluvial formations underlying most of the country. Though initial capital investment for equipment is much lower than for modern rigs, cost per foot of drilling is actually higher for the manual methods. Both naturally developed and gravel-packed wells were completed during the project, including one well with a longitudinally slotted bamboo screen. Propeller pumps were employed to draw water from levels too low for operation of centrifugal pumps in Bangladesh, however, lack of rigidity in PVC casing and inability to put down a completely straight well by manual methods led to frequent pump and well failures. Slow speed diesel engines used experimentally to drive pumps were judged inadequate. Future projections suggest that very small wells capable of irrigating 1 to 5 acres via hand pumps may be the trend for upcoming projects, and that Bangladeshi nationals will soon be able to supervise alone all phases of such well projects. (Eberle-NWWA)
W77-07288

INSTALLATION TIPS ON LARGE SUBMERSIBLES,
General Electric Co., Schenectady, N.Y.
J. J. Collins.
Water Well Journal, Vol. 31, No. 3, p 63-64, March, 1977.

Descriptors: *Pumps, *Pipes, *Joints(Connections), *Installation, Electric insulation, Electric cables.
Identifiers: *Submersible pumps, Torque.

Proper installation of large submersible pumps can prevent problems such as loose column pipe joints. A joint tightening torque of 10 lb. ft. per h.p. for 4-pole motors is recommended to prevent unscrewing of joints due to motor torque; a rope and cathead or an auxillary winch applied to a 4 ft. chain tong may be necessary to supply the needed force when installing 60 to 200 h.p. units. Spot welding or even clamps may sometimes be necessary to ensure that joints will not back off. The amount of unscrewing before damage occurs varies greatly. Spiraling cable may result in electrical failure, which may in turn lead to misdiagnosis of the real underlying problem. Pulling procedure should therefore include checking the cable at and below each band for cuts, cable insulation distortion, and cable tension. Splices and waterproof lead plugs also should be examined for signs of arcing and tension, and the true nature of the problem ascertained before replacing the unit. (Eberle-NWWA)
W77-07289

GEOTHERMAL POWER, THE 'SLEEPER' IN THE ENERGY RACE,
Magma-Thermal Power Project, Santa Rosa, Calif.
For primary bibliographic entry see Field 3E.
W77-07296

ELECTRIC POWER GENERATION FROM GEOTHERMAL HOT WATER DEPOSITS,
California Univ., Livermore. Lawrence Livermore Lab.
A. L. Austin, and A. W. Lundberg.
Mechanical Engineering, Vol. 97, No. 12, p 18-25, December, 1976. 9 fig, 2 tab, 14 ref.

Descriptors: *Geothermal studies, *Energy conversion, *Thermal powerplants, *Electric power production, Turbines, Generators, Heat exchangers.
Identifiers: Flashed steam conversion, Binary cycle conversion, Total flow systems.

Water-dominated geothermal systems are an energy resource from which a great quantity of clean, low-cost electric energy can be extracted. Though dry steam deposits are the easiest to exploit, they are only about one-twentieth as common as hot water deposits. The range of chemical conditions, however, necessitates special systems for the latter. Three conversion concepts -- the flashed steam system, the binary cycle system, and the total flow system -- were compared for efficiency and practicality in this study. In the flashed steam method, the vapor fraction of the wellhead product is increased via an isenthalpic expansion to a lower pressue, and the derived steam used to power turbines. The binary cycle system makes use of a heat exchanger to vaporize a secondary working fluid to drive turbines. The total flow concept utilizes a mixed phase expander to modify the incoming flow of geothermal fluid. Although still in experimental stages, total flow promises to be the most efficient method of the three. Problems will need to be worked out, howeer, before total flow systems can be developed commercially. (Eberle-NWWA)
W77-07300

DOWNHOLE MEASUREMENTS THROUGH MODIFIED DRILL PIPE,
Shell Development Co., Houston, Tex. Bellaire Research Center.
For primary bibliographic entry see Field 8G.
W77-07304

PARAMETER STUDY OF VARIABLES AFFECTING THE PERFORMANCE OF A HYDRAULIC PIPELINE DREDGE MODEL,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07346

GEOTHERMAL RESOURCES, A NEW LOOK,
For primary bibliographic entry see Field 4B.
W77-07477

PUMPED STORAGE OPTIMIZATION IN GENERATION SYSTEMS,
Natal Univ., Durban(South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-07525

RECLAMATION RESEARCH IN THE SEVENTIES, SECOND PROGRESS REPORT,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07600

8D. Soil Mechanics

PROCEEDINGS OF THE SEVENTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 587, Price codes: A11 in paper copy, A01 in microfiche.
Report No CDS-181 and Sea Grant Report TAMU-SG-76-105, September 1975. 247 p. Herbich, J.B., editor. NOAA 04-5-158-19.

Descriptors: *Conferences, *Publications, *Dredging, *Inland waterways, Excavation, Channel improvement, Remote sensing, Equipment, Oceans, Estuaries, Estuarine environment, Suspended solids, Pumping, Pipelines, Hydraulics, Sediment control, Trenches, Harbors, Transportation, Channels, Soil physical properties, Aquatic life, Deposition(Sediments).
Identifiers: Dredges, Cutterhead dredges.

This seminar was held in New Orleans, Louisiana, November 8, 1974. Topics presented were: Salvops-Hopper Dredge 'A. MACKENZIE', Use of Aerial Remote Sensors to Monitor Dredging Projects, Dredged Material Disposal Effects and Alternatives, Parameter Study of Variables Affecting the Performance of a Hydraulic Pipeline Dredge Model, The Port of New Orleans and Its Dredging Program, Problems Associated with Construction of Submarine Pipelines, Compressibility and Strength of Compacted Dredgings, Permeability and Drainage Characteristics of Dredgings, Concepts for the Reclamation of Dredged Material, and The Responses of Some Estuarine Organisms to Suspended Solids. (See W77-07343 thru W77-07353) (Humphreys-ISWS)
W77-07342

SALVOPS-HOPPER DREDGE 'A. MACKENZIE',
Army Engineer District, Galveston, Tex.
D. S. McCoy.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 1-23, September 1975. 14 fig.

Descriptors: *Inland waterways, *Navigation, *Hazards, *Texas, Safety, Channel improvement, Channels, Ships, Dredging.
Identifiers: *Galveston entrance channel, Ship salvage.

On April 24, 1974, while dredging the north half of the Galveston entrance channel, the U.S. Hopper Dredge 'A. MACKENZIE' was involved in a three-vessel collision. She sank in 42 feet of water. The 50 year old MACKENZIE turned crosswise in the channel as she sank, blocking the north half of the entrance channel serving the ports of Galveston, Texas City, and Houston. The dredge was declared a total loss after a thorough investigation of the ship's condition. The ship was cut in place and removed for sale as scrap. The MACKENZIE salvage operation was completed in 117 working days. The job was accomplished without any shipping mishaps despite the close quarters between ship traffic to and from the 3 ports. An estimated 4,700 ships used the channel during this period, with only brief delays, if any, caused by the salvage operation. There were no injuries incurred by the work crew, which numbered up to a peak of 125 persons during the lifting operations. Environmentally, the entire operation was accomplished with only relatively minor fish loss, and this loss occurred essentially only at the time of the first use of explosives. Elaborate preparations were made to control any oil spillage which might have occurred, but there was virtually no oil loss from the MACKENZIE, and there was no known environmental damage. (See also W77-07342) (Humphreys-ISWS)
W77-07343

USE OF AERIAL REMOTE SENSORS TO MONITOR DREDGING PROJECTS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
J. L. Machemehl.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 24-28, September 1975. 6 ref.

Descriptors: *Remote sensing, *Dredging, *Monitoring, Aerial photography, Films, Photography, Coasts, Erosion, Estuaries, Currents(Water), Sediment distribution, Estuarine environment, Waves(Water), Water pollution.

Application of aerial remote sensing to the dredging industry was reviewed. The primary aerial remote sensors considered were black and white, black and white infrared, color, color infrared aerial photographs, and multispectral aerial photographs. Remote sensing can be utilized to obtain data for designing, planning, and controlling a dredging project. (See also W77-07342) (Humphreys-ISWS)
W77-07344

DREDGED MATERIAL DISPOSAL EFFECTS AND ALTERNATIVES,
Army Engineers Waterways Experiment Station, Vicksburg, Miss.
R. M. Meccia.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 29-42, September 1975. 8 fig, 1 tab.

Descriptors: *Dredging, *Research and development, *Programs, *Resources development, Excavation, Land use, Land management, Aquatic life, Wetlands, Marshes, Habitat improvement, Spoil banks, Landfills, Aquatic environment, Navigation, Channel improvement.
Identifiers: Dredged material disposal.

Dredging to create and maintain navigable channels for the nation's waterborne commerce inherently requires removal of large quantities of sediment, which must be disposed of economically but with the least possible adverse environmental impact. But just what are the impacts or effects, and what are the alternatives. A research program of national scope is underway at the Corps' Waterways Experiment Station to seek answers to basic and critical questions. The objective of the Dredged Material Research Program (DMRP) is to develop technically satisfactory, environmentally compatible, and economically feasible alternatives for dredging and disposal, including considering the dredged material itself as a manageable resource. Dredged material had once been regarded as a nuisance waste product to be dumped in open waters or on marshes without any awareness of the environmental consequences. The program goals and tasks are consolidated into the four areas of aquatic disposal, habitat development, disposal operations, and productive uses. The field and laboratory investigations underway in each of these broad areas were briefly discussed. (See also W77-07342) (Humphreys - ISWS)
W77-07345

PARAMETER STUDY OF VARIABLES AFFECTING THE PERFORMANCE OF A HYDRAULIC PIPELINE DREDGE MODEL,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
D. R. Basco.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 43-78, September 1975. 24 fig, 6 ref.

Descriptors: *Dredging, *Model studies, *Pumps, *Hydraulics, Pumping, Slurries, Discharge lines, Design criteria, Pipelines, Theoretical analysis, Mathematical models, Equations, Evaluation, Analytical techniques, Head loss, Sediment discharge, Sediment transport, Horsepower, Cavitation.
Identifiers: Dredge model.

Reviewed were the elements of an equation-based model of hydraulic dredging systems which correctly demonstrate the effects of line length, digging depth, and grain size on solids output of

the dredge. Limited field data 'agreed' with the model results. Based on the pump performance curves available and the use of the computer model described, it was concluded that: (1) the 'one-dredge-pump-is-as-good-as-another' (hydraulically) hypothesis must be rejected. Substantial differences in production (50% + or -) were demonstrated for both the horsepower (line-length) and cavitation (digging depth) solids output limiting criteria; (2) the model dredge program can systematically and economically study the effects of variables such as horsepower available, suction-pipe size, and particle size. This work is continuing in order to examine additional variables such as booster pumps (suction and discharge), pump location, terminal elevation, discharge pipe size, etc. (See also W77-07342) (Humphreys - ISWS)
W77-07346

MAINTENANCE DREDGING IN THE NEW ORLEANS DISTRICT, US ARMY CORPS OF ENGINEERS,
Army Engineer District, New Orleans, La.
H. R. Vick.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 79-110, September 1975. 22 fig.

Descriptors: *Dredging, *Maintenance, *Navigation, *Mississippi River, *Louisiana, Inland waterways, Channel improvements, Rivers, Channels, Equipment, Jetties, Shoals, Navigable waters, Inlets(Waterways).

The New Orleans District of the Corps of Engineers covers an area of 47,000 sq mi. The area covered includes most of Louisiana and small portions of Mississippi, Arkansas, and Texas. There are approximately 2800 miles of navigable waterways, including 405 miles of deep draft waterways. Each year 110 miles of deep draft (authorized depths, 30-42 ft) channels and 60 miles of shallow draft (5-20 ft) channels are dredged. The principal navigation projects in the district were described in this report, and the dredging activities for the years 1968-1972 were summarized. (See also W77-07342) (Humphreys - ISWS)
W77-07347

THE PORT OF NEW ORLEANS AND ITS DREDGING PROGRAM,
Williams-McWilliams Co., Inc., New Orleans, La.
C. B. Hakenjos.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 112-123, September 1975. 5 fig.

Descriptors: *Harbors, *Louisiana, *Dredging, Water resources development, *Mississippi River, Programs, Projects, Transportation, Navigation, Resources development, Facilities, Inland waterways.
Identifiers: *New Orleans(La).

The port of New Orleans has a 30-year, $400,000,000 development plan called Centroport USA. This plan includes a partial move from the congested bank of the Mississippi River to a tidewater area along the Mississippi River-Gulf Outlet. The location of initial barge carrier terminals will be determined by the adequacy of the connection between the tidewater area and the river because the present connection through the Industrial Canal Lock has reached total capacity. A new ship lock and connecting channel is now (1975) being designed, and completion is scheduled for 1981. Dredging for the port is done in the two deep-water passes of the Mississippi River, the wharves along the Mississippi River, the Industrial Canal, and the Mississippi River-Gulf Outlet. Meeting the future port goals is highly dependent upon the accomplishment of major new dredging projects and an increasing major maintenance dredging program. (See also W77-07342) (Humphreys - ISWS)
W77-07348

PROBLEMS ASSOCIATED WITH CONSTRUCTION OF SUBMARINE PIPELINES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
W. A. Dunlap.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 124-139, September 1975. 7 fig.

Descriptors: *Construction, *Underwater, *Pipelines, *Trenches, Hydraulic structures, Movement, Submergence, Slope stability, Bottom sediments, Scour, Soil mechanics, Soil stability, Stability.
Identifiers: Liquefaction, Bottom slides.

Submarine pipeline problems were discussed, and a few solutions were presented. Flexible pipe joints and pipelines with relatively low specific gravities, approaching that of water, appear to at least partially set the stage for some of the problems. Causes of pipeline movement include liquefaction of the soil surrounding the pipe, wave induced motions of bottom sediments, scour of material surrounding pipe, and trench sidewall slides. Several points recommended for a contractor to consider when faced with construction of a submarine pipeline were: (1) Look closely at the soil profile presented with bid documents. Borings for design purposes should show the soil types involved. If silts and fine sands are encountered, be wary of liquefaction problems. (2) Closely examine side slopes for trenches to make sure these slopes are stable during the construction period. Side slopes of 1.30 to 1.50 seem desirable. (3) Backfill the trench completely and quickly. Do not, under any circumstances, leave the pipe partially backfilled during periods when storm activity is expected. (4) Remove any mounds of material or fill bottom depressions resulting from construction operations. (5) Perform adequate and frequent bottom surveys to show that the pipe was constructed to proper line and grade and to show that backfill was also properly placed to grade. (6) Consider borings into the backfill material at various stages during construction, particularly just before shutting down for winter. (See also W77-07342) (Humphreys - ISWS)
W77-07349

COMPRESSIBILITY AND STRENGTH OF COMPACTED DREDGINGS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
M. W. Giger, and R. J. Krizek.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 140-153, September 1975. 9 fig, 1 tab, 8 ref. EPA 15070-GCK, R-800948.

Descriptors: *Dredging, *Soil physical properties, *Laboratory tests, *Soil tests, Liquid limits, Soil density, Soil strength, Soil properties, Shear strength, Compaction, Compressibility, Data collections, Plasticity index, Particle size, Uniformity coefficient.
Identifiers: Dredged materials.

Laboratory tests were performed on three samples of polluted dredgings from Riverside Site in Toledo, Ohio, to evaluate their compaction, compressibility, and strength characteristics. Based on these tests, the following conclusions were advanced: (1) Upon compaction at approximately the optimum water content, the dredgings exhibited maximum dry densities of 78 to 86 pounds per cubic foot (pcf) for Standard Proctor compactive effort, 82 to 94 pcf for Modified Proctor compactive effort, and 90 to 100 pcf for Harvard Miniature compactive effort. (2) A comparison between the maximum dry densities of compacted dredgings and the dry densities of hydraulically placed dredgings indicated that the capacity of a given disposal site may be increased substantially by compacting the materials. (3) The compressibility of dredgings is strongly related to dry density, and their load-deformation characteristics are comparable to those of loose sand and significantly larger than those of dense sand, Vicksburg clay, ad Grundite. (4) Compacted dredgings exhibited shear strengths which were substantially higher than the strengths of natural, hydraulically placed materials. (5) The compressibility and strength characteristics of dredgings can be improved considerably by use of compaction procedures. (See also W77-07342) (Humphreys-ISWS)
W77-07350

PERMEABILITY AND DRAINAGE CHARACTERISTICS OF DREDGINGS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
R. J. Krizek, J. S. Jin, and A. M. Salem.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 154-179, Setember 1975. 9 fig, 8 tab, 12 ref. EPA 15070-GGK, R-800948.

Descriptors: *Dredging, *Soil physical properties, *Laboratory tests, *Soil tests, Soil properties, Permeability, Dewatering, Laboratory equipment, Analytical techniques, On-site tests, Drainage, Data collections, Void ratio, Consolidation, Gradation, Soils, Testing procedures.
Identifiers: Dredged materials.

The dewatering of disposal areas composed of polluted maintenance dredgings is directly related to the permeability and drainage characteristics of these materials, but relatively little quantitative data regarding these properties are available. This study synthesized the results determined from several different types of laboratory tests on a variety of different dredgings, and the coefficient of permeability was found to decrease from about 0.0001 to 10 to the minus 9th power cm/sec as the void ratio decreases from approximately 10 to 0.6; data from two field infiltration tests indicated permeability values on the order of 0.0001 to 0.00001 cm/sec for materials that yielded laboratory values of about 10 to the minus 7th power to 10 to the minus 8th power cm/sec. The electro-osmotic coefficient of permeability was found to be on the order of 0.00003 sq cm/volt-sec, which is about one-half the value used for a large variety of soils. A partial vacuum served to increase substantially the dewatering rate as compared to drainage by gravity alone. The overall permeability and drainage characteristics of polluted maintenance dredgings were comparable to those for many fine-grained, organic soils. (See also W77-07342) (Humphreys-ISWS)
W77-07351

CONCEPTS FOR THE RECLAMATION OF DREDGED MATERIAL,
Hittman Associates, Inc., Columbia, Md.
C. W. Mallory, and R. M. Meccia.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 180-214, September 1975. 13 fig, 9 tab.

Descriptors: *Dredging, *Land reclamation, *Settling basins, *Retention, Gradation, Soils, Basins, Slurries, Separation techniques, Analytical techniques, Sands, Gravels, Silts, Clays, Flow rates, Pumping, Dewatering.
Identifiers: Dredged materials.

Over the past two decades, increasing use has been made of containment facilities to store the materials generated in dredging operations. Land disposal of dredged material is expected to increase, and it has been estimated that 7,000 acres of new land will be required each year for the containment of material generated from maintenance dredding operations. Because of intensive land use in areas adjacent to many dredging operations, suitable land disposal sites will be difficult to obtain in the future. Land disposal of dredged material has used conventional containment facilities to separate the solids and provide long-term, if not indefinite, storage of the separated material. In order to reduce the commitment of land for this purpose, investigations were made of alternatives to the use of conventional containment facilities. Concepts for reducing the size and for prolonging the useful life of containment facilities were defined for evaluation purposes. The defined concepts included the separation and reclamation of useful materials, the separation and handling of materials for offsite disposal, and methods for improving the effectiveness of separation and handling processes. (See also W77-07342)(Humphreys-ISWS)
W77-07352

THE RESPONSES OF SOME ESTUARINE ORGANISMS TO SUSPENDED SOLIDS,
Lawler, Matusky and Skelly Engineers, Tappan, N.Y.
J. M. O'Connor, and J. A. Sherk.
In: Proceedings of the Seventh Dredging Seminar; Held November 8, 1974, New Orleans, Louisiana. Sea Grant Report No. CDS-181, TAMU-SG-76-105, Texas A and M University, College Station, p 215-234, September 1975. 2 fig, 5 tab, 12 ref.

Descriptors: *Dredging, *Environmental effects, *Estuaries, *Aquatic life, Suspended solids, Laboratory tests, Testing procedures, Fish, Zooplankton, Algae, Phytoplankton, Lethal limit, Fish physiology, Bioindicators.

Outlined in general terms were some of the results of laboratory studies undertaken to assess the impact of suspended solids on estuarine organisms common to the bays and rivers of the Atlatic Coast of North America. Conclusions derived from the studies were summarized as follows: (1) Suspended solids have significant effects on primary productivity, zooplankton feeding rates, fish survival, and the physiological state of fishes. Although the experiments conducted used heavy concentrations of solids, the scope of responses observed was deemed meaningful as a general phenomenon and ma be more pronounced among less hardy species in natural environments. (2) The lethal and sublethal effects of resuspended natural muds were less than those of mineral solids. (3) The effects of suspended sediments on phytoplankton and zooplankton appeared to be related to particle concentration rather than to particle size. The results obtained from tests with phytoplankton were basically those one would expect from reduction in light intensity. (4) Dredging and spoiling operations are capable of producing suspended solids concentrations capable of affecting the natural function of organisms and ecosystems as a whole. It is unlikely that harmful concentrations of suspended solids would persist for a period of time sufficient to induce meaningful lethal or sublethal effects on most communities. (See also W77-07342) (Humphreys-ISWS)
W77-07353

8E. Rock Mechanics and Geology

RECTILINEAR LEADS AND INTERNAL MOTIONS IN THE ICE PACK OF THE WESTERN ARCTIC OCEAN,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 2C.
W77-07373

8F. Concrete

DESIGN OF GRAVITY DAMS, DESIGN MNUAL FOR CONCRETE GRAVITY DAMS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W77-07151

8G. Materials

THE CHIEF DRILLER'S REPORT ON JCCIP,
Christian Organization for Relief and Rehabilitation, New York.
For primary bibliographic entry see Field 8C.
W77-07288

INSTALLATION TIPS ON LARGE SUBMERSIBLES,
General Electric Co., Schenectady, N.Y.
For primary bibliographic entry see Field 8C.
W77-07289

CATHODIC PROJECTION OF BOREHOLE CASING,
M. Unz.
Materials Performance, Vol. 14, No. 10, p 40-47, October, 1975.

Descriptors: *Cathodic protection, *Well casings, *Corrosion, *Corrosion control, Steel pipes, Cement grouting, Resistivity, Electric currents, Electrochemistry, Deep wells.
Identifiers: Galvanic effects, Composite casing, Cathodic current density, Reflected Image Method, Axial voltage gradient.

Outer well casing is subject to intensive corrosion attack from several sources, and because it is difficult to get a uniform coating of hydraulic cement on external casing surfaces, cathodic protection is necessary. By analyzing data from potential profiles, amount of current necessary to achieve maximum protection can be determined. Outer cathode voltage profiles can be readily derived from internal probing tests, and these voltage profiles (known as current density) indicate the actual degrees of protection attained at various depths of a casing string. Numerous examples of computation of voltage potential and application of test systems to both shallow and deep wells are given. (Eberle-NWWA)
W77-07297

NEW RIG CONCEPT USES CONTINUOUS DRILL STRING.
World Oil, Vol. 184, No. 4, p 94-97, March, 1977. 3 fig.

Descriptors: *Rotary drilling, *Drilling equipment.
Identifiers: *Uni-Flex Rig Company(Alberta Canada), Continuous drill string, Downhole motors.

A new idea in drilling rigs, developed by Uni-Flex Rig Company Ltd. of Brooks, Alberta, Canada, has several advantages that allow it to drill up to a 6 1/4 inch hole to 3000 feet at reduced cost. The rig utilizes a continuous string of coiled aluminum pipe which eliminates the drill pipe joining operation and can reduce the drilling crew by two men per shift. A Dyna-Drill positive displacement downhole motor is used with conventional bits at relatively high RPM. A stinger crane replaces the derrick and blocks for hoisting the three drill collars used with the string. An injector runs the pipe in and out of the hole at rates up to 150 ft./min. Penetration rates are comparable to those of conventional rotary rigs, and deviation problems are average. The new rig's limitations at present are low hoisting capacity, necessity of outside services for completing the surface hole, and limited bit selection. To date, the rig has drilled several gas wells in southeastern Alberta and has been used to drill out faulty plugs during a well reabandonment program. (Eberle-NWWA)
W77-07298

NEW LOST CIRCULATION REMEDY IS EASY TO USE.
World Oil, Vol. 184, No. 4, p 76-77, March, 1977. 1 tab.

Descriptors: *Rotary drilling, *Slurries, Drilling fluids.
Identifiers: *Magne-Set, Lost circulation, Well plugs.

A new material has been developed to combat lost circulation problems. A blend of magnesium and other inorganic materials, Magne-Set (developed by Oil Base, Inc., of Houston) is blended into a pill and when pumped into a zone of lost circulation, cures into a solid cement-like plug. Special blending equipment, fluids, and pumps are unnecessary, and setting additives allow the adjustment of setting time from two to seven hours to accommodate specific well needs. After the lost circulation zone is located, drill pipe is positioned above the zone and the Magne-Set slurry is pumped down at a maximum rate. The slurry is either left spotted in the hole or squeezed into the formation. Mud is then conditioned in a similar fashion as for green cement or chloride contamination, and drilling can be resumed after washing and reaming the bottom of the hole. (Eberle-NWWA)
W77-07299

GEOTHERMAL ENERGY: NEEDED, EFFECTIVE HEAT TRANSFER EQUIPMENT,
International Society for Geothermal Engineering, Whittier, Calif.
E. F. Wehlage.
Mechanical Engineering, Vol. 98, No. 8, p 27-33, August, 1976. 10 fig, 20 ref.

Descriptors: *Geothermal studies, *Thermal power plants, *Electric power production, *Energy conversion, *Scaling, Fouling, Corrosion control, Turbines, Generators, Heat exchangers.
Identifiers: Magmamax Geothermal System, Keller Rotating Oscillating Vane Machine, Hutchinson-Holt Process.

Although geothermal heat transfer has been highly successful in a few cases, general results are somewhat discouraging for several reasons. Fouling due to high proportions of dissolved solids in thermal water is an almost universal threat, and in cases where deposition is controlled, corrosion seems to be accelerated. Studies of scaling versus fluid temperature and dissolved gas concentrations may improve the capability to deal with such problems, but a serious data shortage exists at present in this area. The binary cycle concept of geothermal energy conversion is predicated upon effective heat exchange equipment -- by separating raw wellhead fluids from working fluids used to power turbines, deposition problems might be minimized. The 'Magmamax' Geothermal System, the Keller Rotating Oscillating Vane Machine, and the Hutchinson-Holt Process are among the more promising modifications of basic binary cycle concepts under development. Geothermally energized refrigeration processes to bypass the generation of electric power for compression also appears feasible and desirable for various applications. (Eberle-NWWA)
W77-07301

GEOTHERMAL SYSTEMS AND POWER DEVELOPMENT,
Department of Scientific and Industrial Research, Auckland (New Zealand).
For primary bibliographic entry see Field 4B.

W77-07302

DOWNHOLE MEASUREMENTS THROUGH MODIFIED DRILL PIPE,
Shell Development Co., Houston, Tex. Bellaire Research Center.
E. B. Denison.
Drilling-DCW, Vol. 38, No. 5, p 53-56, March, 1977. 8 fig, 3 ref.

Descriptors: *Drill monitors, *Electrical well logging, *Electronic equipment, *Telemetry, Logging(Recording), Boreholes, Steel pipes, Rotary drilling.
Identifiers: *Drill pipes, Drill collars, Electrical connections.

The ability to continuously monitor downhole parameters while drilling has great utility for safety, logging, borehole surveying, and drilling optimization. The system discussed uses electrical data transmission, which can accommodate a data rate three orders of magnitude greater than any mud pulse scheme and at least one order of magnitude greater than electromagnetic or acoustic systems. Dozens of downhole parameters can be monitored simultaneously. Experimentation with the system in October, 1975, yielded satisfying results in a 600 meter, 114 hour drilling test. Problems with electrical connections were slight, and very little time was lost in recleaning the connections. Among the parameters measured at this time were borehole inclination and magnetic heading, annulus pressure, pipe pressure, temperature, and accelerations along three orthogonal axes. Unlike other techniques, the system does not require a downhole power source. (Eberle-NWWA)
W77-07304

COMPRESSIBILITY AND STRENGTH OF COMPACTED DREDGINGS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07350

PERMEABILITY AND DRAINAGE CHARACTERISTICS OF DREDGINGS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-07351

8H. Rapid Excavation

THE INFLUENCE OF UNDERWATER EXPLOSION ON FISH, (IN JAPANESE),
S. Sakaguchi, O. Fukuhara, S. Umeyawa, M. Fujiya, and T. Ogawa.
Bulletin of the Nansei Regional Fisheries Research Laboratory, Vol 9, p 33-56, 1976. 14 fig, 2 tab, 2 ref.

Descriptors: *Explosions, *Fishkill, *Fish physiology, Excavation, Bridge construction, Marine fish, Freshwater fish, Carp, Mode of action, Laboratory tests, On-site investigations.
Identifiers: Rockfish, Sebastiscus marmoratus, Instantaneous cap blasting, Borehole blasting, Energy flux density, Underwater explosions.

Common carp, Cyprinus carpio, and rock fish, Sebasticus marmoratus, were examined for damage to internal and external organs following underwater explosions with differing orientations to the fish. Damage was most serious when the explosion was ventral to the fish and leas serious when caudally located. Rupture of the sinus verosus and damage to the liver and kidney were the most common effects. Peak pressure is the usual indicator of explosion strength but this study found damage to fish to be more closely related to the energy flux density. (Katz)
W77-07316

8I. Fisheries Engineering

THE INFLUENCE OF UNDERWATER EXPLOSION ON FISH, (IN JAPANESE),
For primary bibliographic entry see Field 8H.
W77-07316

COLLECTION OF JUVENILE SALMONIDS FROM TURBINE INTAKE GATEWELLS OF MAJOR DAMS IN THE COLUMBIA RIVER SYSTEM,
Bureau of Commercial Fisheries, Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-07419

THE EFFECTS OF HIGH VACUUM ON FISH,
Arkansas Game and Fish Commission, Lonoke.
For primary bibliographic entry see Field 5C.
W77-07421

EFFECTS OF DAMS ON PACIFIC SALMON AND STEELHEAD TROUT,
National Marine Fisheries Service, Seattle, Wash.
For primary bibliographic entry see Field 5C.
W77-07426

SECOND STATUS REPORT ON ANADROMOUS FISH RUNS OF THE COLUMBIA RIVER,
Oregon Fish Commission, Portland.
For primary bibliographic entry see Field 5C.
W77-07427

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

BIBLIOGRAPHY AND INDEX OF NORTH DAKOTA WATER RESOURCES 1878-1970,
North Dakota Univ., Grand Forks.
For primary bibliographic entry see Field 10C.
W77-07140

10C. Secondary Publication And Distribution

BIBLIOGRAPHY AND INDEX OF NORTH DAKOTA WATER RESOURCES 1878-1970,
North Dakota Univ., Grand Forks.
M. W. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 346, Price codes: A25 in paper copy, A01 in microfiche. North Dakota Water Resources Research Center, Fargo, Research Project Technical Completion Report, No. WI-221-038-76, August, 1976, 570 p. OWRT A-029-NDAK(2). 14-31-0001-5034.

Descriptors: Bibliographies, *Publications, *Water resources, *North Dakota, Documentation, History, Agriculture, Artesian wells, Floods, Flood control, Groundwater, Irrigation, Lakes, Maps, Missouri River, Water supply.

This bibliography is a collection of references relating to water resources in North Dakota from 1878 through 1970. Subject index and author index are included.
W77-07140

A BIBLIOGRAPHY OF SOVIET LITERATURE ON FRESHWATER HYDROBIOLOGY AND RELATED PROBLEMS FOR 1975: PART 21, (IN RUSSIAN),
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W77-07402

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SNOW AND ICE HYDROLOGY IN THE UNITED STATES--CURRENT STATUS AND FUTURE DIRECTIONS,
National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 2C.
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For primary bibliographic entry see Field 6G.
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For primary bibliographic entry see Field 5D.
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SNOW AND ICE HYDROLOGY IN THE UNITED STATES--CURRENT STATUS AND FUTURE DIRECTIONS,
National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 02C.
W77-07565

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SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Cornell University, Policy Models for Water Resources Systems	W77-07523--07531 07533--07538 07541--07558	33
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W77-07375--07386 07388--07389 07391 07393--07397 07399--07401 07403--07404 07433	26
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-07205--07227	23
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University of Wisconsin, Eutrophication	W77-07440--07457 07459--07474 07497--07511 07513--07521	58
University of Wisconsin, Water Resources Economics	W77-07435--07439	5
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W77-07101--07104 07140--07141 07281--07285	11

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C. OTHER		
BioSciences Information Service	W77-07107--07108 07112, 07117 07133, 07228 07234, 07241 07291--07292 07312, 07321 07331, 07335 07387, 07390 07392, 07398 07402, 07418 07428, 07458 07475, 07482 07512, 07532 07539--07540 07568--07599	60
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Environmental Information Services, Inc. (Gas Bubble Disease)	W77-07415--07417 07419--07427 07429--07432 07559	17
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SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER (CONTINUED)		
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Ocean Engineering Information Service (Outer Continental Shelf)	W77-07405--07414	10
U. S. Geological Survey	W77-07476 07478--07481 07483--07496	19

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